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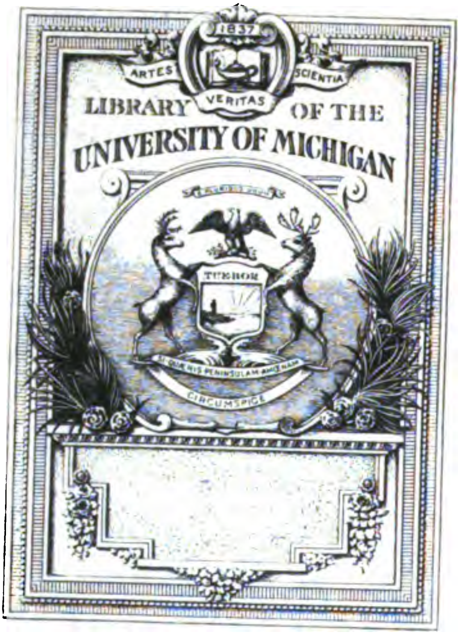
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A
COMPENDIUM
OF
PRACTICAL ARITHMETICK.

BY

JOHN THOMAS HOPE,

LATE MASTER OF THE ACADEMY,

CALCUTTA.

CALCUTTA:
FROM THE PRESS OF JOSEPH COOPER.

M, DCC, XC.

TO THE RIGHT HONOURABLE

CHARLES EARL CORNWALLIS,

KNIGHT OF THE MOST NOBLE ORDER OF THE GARTER; ONE OF HIS BRITANNICK MAJESTY'S MOST HONOURABLE PRIVY COUNCIL; LIEUTENANT GENERAL OF HIS MAJESTY'S FORCES; GOVERNOR GENERAL AND COMMANDER IN CHIEF OF ALL THE POSSESSIONS AND FORCES OF HIS BRITANNICK MAJESTY, AND OF THE HONOURABLE THE UNITED COMPANY OF MERCHANTS OF ENGLAND, IN THE EAST INDIES, &c. &c. &c.

4-20-28 H.R.5

MY LORD,

THE following Compendium of Mercantile Arithmetick, entirely adapted in its calculations for the uſe of ſtudents of that ſcience in this country, I beg leave, with all due deference, to entreat your Lordſhip's protection of; humbly requeſting, that it may receive the ſanction of your auſpicious patronage, and truſting from your known candour in encouraging every uſeful improvement, that your Lordſhip will conſider my attempts as the effects of an earneſt inclination to become further uſeful to the youths, whom I had the happineſs to be in charge of, and to the publick in general; who, from their continual encouragement, have bound me in grateful ſervices to them.

Until ſome able arithmetician ſhall ſtep forward, and enlarge upon this field of improvement, I preſume this Work will be particularly uſeful to the conductors of the Orphan School, an inſtitution which redounds to the higheſt honour of its founders; and proves, in the greateſt degree, the noble characteriſtick of liberality, which, it is allowed, flows ſo abundantly from the hearts of our countrymen in this climate; and which your Lordſhip, through motives of humanity, and a deſire of tenderly befriending every part of the community, has accepted the patronage of.

I am, my Lord,

Your Lordſhip's

Moſt obedient,

And humble Servant,

J. T. HOPE.

ACADEMY,
1ſt July, 1789.

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PREFACE.

PREFACE.

AGREEABLE to a long adopted cuſtom of introducing publications to the world, it will, (I preſume) be naturally expected, that ſomething ſhould be prefaced to a work of this kind, now offered to the publick; the plan of which, I truſt the candid will allow, is well adapted to promote the facility of acquiring a knowledge in figures, better by calculating with coins and weights, &c. which the learner is acquainted with, than with thoſe he can have but a diſtant idea of. Indeed it is much to be lamented a taſk of this kind, (the want of which has ever been experienced in this country) has not long ago been undertaken, which would not only have anſwered the above purpoſe, but have ſaved the inſtructors of youth much trouble, by their being obliged to compoſe ſums for their ſcholars; a circumſtance, which muſt be particularly irkſome to them, as from the nature of their buſineſs, there can ſcarcely be allowed any time for ſuch employment; and as their ſums cannot be ſuppoſed to be always ready, it will of courſe in ſome meaſure impede the progreſs of the youth committed to their charge; nor do I believe it poſſible for maſters, (conſidering the many things they have to think of) to frame queſtions in all the various rules, without making them of too great a ſameneſs.

The great utility of Arithmetick, is univerſally allowed: for it is well known, that no buſineſs, commerce, trade, or employment of any nature, or kind ſoever, can properly be carried on without the aid of figures: It is a ſcience indeed neceſſary to every order of men, from the higheſt to the loweſt; and I think it may be ſaid to be particularly ſo, in this part of the world: for the inconveniencies our youth labour under, in not having the advantage of the mechanical profeſſions to follow, obliges them chiefly to have recourſe to the quill and accompts, for their ſubſiſtance.

"Arithmetick," ſays Mr. Locke, in his excellent *Thoughts on Education* "is the eaſieſt, and conſequently "the firſt ſort of abſtract reaſoning, which the mind "commonly bears or accuſtoms itſelf to: and is of ſo "general a uſe in all parts of life and buſineſs, that "ſcarce any thing is to be done without it. This is certain, a man cannot have too much of it, nor too perfectly: he ſhould therefore begin to be exerciſed in "counting, as ſoon, and as far, as he is capable of it, and "do ſomething in it every day, 'till he is maſter of the "Art of Numbers."

It is certainly the moſt pleaſing, as well as beſt way, in the inſtruction of youth, to deduce things from their firſt principles; and from the ſimpleſt evidences, explain the more complicated, not only to inform the learner, how the operation is to be performed; but to point out to him a ſufficient reaſon for ſuch operation.

I believe no perſon ever entertained a notion of making children maſters of Arithmetick; my deſign is to lead them on gradually through the various rules, and explain the theory of each according to their ſeveral capacities, which will prepare them, if they have any genius, and deſire to purſue the ſtudy, to enter into the more minute parts of it: and as every maſter may be ſuppoſed to be ſufficiently acquainted with every thing contained in this work, here will be plenty of room for him to purſue his own methods; and as the capacities of children are ſo various, it would be beſt to be guided by their obſervations on them, in following the rules, as they are laid down, or vary the order of their ſucceſſion; and likewiſe by the number of queſtions in each rule, either making them go through the whole, that are inſerted, which I believe are ſufficient for the dulleſt capacities, or part only, according as they are more or leſs perfect. I have made ſome boys begin with Decimals, and others have gone into Vulgar Fractions after Reduction; and I have known ſome maſters, who have given their ſcholars Algebra to learn immediately after Diviſion, when perhaps they have not been more than ſeven years of age; and howſoever ſtrange it may appear, it is not the leſs true.

This Compendium, which contains the whole of the Rules uſually taught in ſchools, will be found to be very uſeful, to all claſſes of people, whether the gentleman, ſcholar, or man of buſineſs; but more ſo to the directors of ſchools: particular regard is had to the forming of the rules, ſo as to be rendered intelligible even to the meaneſt capacity, and that youth of a more mature age will not ſtand in need of a maſter. Great care has been obſerved in the queſtions, which are taken from other books of Arithmetick, that they might be ſelected from the beſt of their kind, and rendered as local as could be, by ſubſtituting the country coins, weights and meaſures, inſtead of the original, and otherwiſe adapting them agreeable to the nature of their ſeveral circumſtances. Thoſe who have not had an opportunity of ſtudying accompts during their pupilage, will now be furniſhed with the means of employing their vacant hours. The ſircar, who underſtands Engliſh, will be enabled to render himſelf of more eſtimation to his employer, by adopting his modes of calculation; and the inconveniencies treated of before reſpecting the youth at ſchool will now be done away, and both inſtructor, and ſtudent receive the benefit of the track here laid before them.

I have no wiſh to exaggerate the merit of this work, and therefore ſhall declare, it was not my intention to enter further into the theory of the ſcience, than is contained in the rules here treated of, which are laid down in the plaineſt and moſt conciſe methods; and the operation at large of the firſt ſum in each rule and caſe, plainly demonſtrated, and proved by varying the operation. The queſtions and anſwers (which it will be obſerved in many places, prove each other and which contribute much to diſcover the reaſon of the operation, and explain the truth of the anſwer) are only given to the reſt; a circumſtance I was reluctantly obliged to ſubmit to, as the work would otherwiſe have been ſwelled to ſo great an extent, that it would have been difficult to accompliſh the publication of it in this country. The various and excellent treatiſes we have on this ſubject, renders any further eſſay almoſt needleſs. Examples on the more abſtruſe parts of Arithmetick, where neither money or weight is concerned, may be found in moſt of the collections; and he that has made himſelf a proficient in numbers, in one country, may with very little pains form his calculations, in any ſpecies whatever.

As to its mode of ſucceſſion, I have commenced with the four fundamental rules, giving two or three examples in each variety, which will be quite ſufficient for the learner to ſet down in his own book: if after that the learner ſhould not be perfect, he may with very little trouble have a few ſums ſet him on his ſlate.

The examples in Reduction, both aſcending and deſcending, are promiſcuouſly mixed: which I have done for this obvious reaſon, that the learner may be put on a cloſer reflection on the nature of them, which would be too apt to be paſſed over ſlightly, if the queſtions were diſtinctly divided. For the ſame reaſon, I have comprehended the Rule of Three, both direct and inverſe, under one general and moſt excellent rule for ſtating the terms. I prefer doing the Double Rule of Three, or Rule of Five, by two ſtatings in the Single Rule of Three: for it is ſo difficult for a youth to arrange the whole five terms in his ideas, ſo that he may perceive at one view, in all queſtions, whether the anſwer is more or leſs, that it muſt certainly be the eaſieſt and beſt way; but to prove that the operations are right, I have ſhewn a method for working the Rule of Five, from the two ſingle Rules.

Practice contains a ſufficient number of queſtions, in all its caſes, when properly explained as they are gone through, to perfect any learner. Next follows the different calculations of rates, per cent. Exchange of Calcutta, with various parts of Bengal, England, Madras, and Bombay, &c. Compariſon of Weights and Meaſures, with the different countries, wrought ſeveral ways, and exemplified with a variety of local queſtions. After various other rules of mercantile Arithmetick, which are all diverſified as much as poſſible, follows the moſt pleaſing part of the ſcience, viz. Poſition, Alligation, Progreſſion, and Permutation: theſe, though not of the greateſt uſe, ſerve to operate on the minds of youth, by exciting their curioſity, affording them entertainment, and filling them with a deſire of becoming acquainted with the ſublime and abſtruſe operations of numbers.

Next in order, follow the doctrine of Vulgar, and Decimal Fractions, rendered eaſy of comprehenſion by explaining their nature and uſe, in the moſt familiar terms. Involution and Evolution, after illuſtrating their ſeveral diſtinctions, and ſhewing a general rule for extracting the roots of all powers, are exemplified in a variety of uſeful queſtions, ſuch as menſuration of houſes, land, ſhips, caſks, &c. and the value of work calculated according to the known cuſtoms of the country — To theſe are added a greater variety of calculations of rates, per cent, than the former, where the rules are laid down by Arithmetical ſigns, and wrought in Decimals,

mals, with the occaſional aſſiſtance of Involution and Evolution. A variety of queſtions are then inſerted to exercise the learner in the whole of the foregoing rules; and laſtly are ſeveral Tables of Intereſt, Batta, and Exchange, both in money and weight, between England, Bengal, and Madras; together with a few neceſſary Decimal Tables, which are intended to ſhew the young tyro the manner of conſtructing them or any ſimilar, and at the ſame time, will be found very uſeful in proving a number of examples in the work, or otherwiſe as may be found neceſſary.

This work contains about one half of what ſome of my youth have gone through, ſince I firſt began with the ſchool. It was my intention to publiſh the whole; but the bad ſtate of health I have experienced, owing to the natural confinement incumbent on my profeſſion, makes it at preſent too laborious an undertaking. The principal thing in the other part is, a Set of Books after the Italian method, entirely local, wherein are inſerted as great a variety of tranſactions, as I could poſſibly collect; which with various other things, may, if health and time hereafter permit, be publiſhed as a Second Volume to this.

I would recommend each ſtudent to have one of theſe books to himſelf, that no impediment might ariſe in the purſuit of his ſtudy, either at home, or at ſchool, which would certainly be the caſe, with a ſingle book, which could only afford one at a time, to take out his queſtions and rules.

Though the ſhorteſt methods of calculating are beſt, when familiar to the practitioner, I am by no means a friend to thoſe methods of contraction, which ſome people take ſo much delight in; as contractions are liable to error and uncertainty, and in order to diminiſh the number of figures in each operation, there is generally more time loſt, than by doing it in the common manner. I would therefore leave it to the pupil's choice, after ſhewing each way, to perform it as he likes; as the eaſier it appears to be attained, renders it more delightful to be entered on; whereas to inſiſt upon methods that appear difficult of acceſs, often damps the genius of the learner, and renders him ever after incomparably dull.

In all ſtudies every thing ſhould be regulated according to the capacity of the pupil; and as ſome require a greater attention of the mind in the purſuit of them than others, I would for that purpoſe recommend the morning as the propereſt time for them oſt difficult ſtudies of the day, while the head is clear, and refreſhened by ſleep, and provided the conſtant attendance of the ſcholar is promoted at ſchool. I think the whole of this work may very well be run over in the courſe of four years. I cannot pretend to preſcribe a certain period for the commencement of this ſtudy; that circumſtance alſo muſt be regulated by the capacity of the youth.

I cannot omit mentioning how much it is to be pitied, that ſome of the youth in this country have but ſo poor a chance of acquiring even a tolerable ſhare of education; I have repeatedly had occaſion to remark, that children are often placed to ſchool at a very early period of their infancy, perhaps through the inconveniency of keeping them at home, or other domeſtick occurrences; and frequently without conſidering the nature of the perſon with whom they are placed; thus they are ſuffered to acqure ſuch bad habits, that it is with the greateſt difficulty they can be broke of them, when they are removed to ſchools which are thought to be more proper for them: others again, through the miſtaken partiality of the parent, are expected to make a great progreſs in their learning; and the maſter, to convince the parents of his endeavours to promote their improvement, is againſt his own inclination the cauſe of much miſchief; thus the child is dragged on perhaps two or three years ſo imperceptibly in it, that the tutor obtains no credit by him; whereas if he is ſufficiently known, and a proper confidence could be placed in him, theſe evils might have been prevented. If at the age of thirteen or fourteen, he ſhould perchance diſcover a ſpark or two of genius, partiality ſtamps him a man, and he is taken away from ſchool juſt at a time when it began to be of ſervice to him; he would have learned more in the courſe of one or two years ſtudy, than ever he could before or after that period; and as there is ſcarce more than one line of life for him to purſue in this country, he is ſuffered to idle three or four years at home, or being about the Counting Houſe, until he can render himſelf of any uſe.

I have every imaginable reaſon to believe that the youth of this climate, (though I can venture to aſſert they earlier attain to the age of puberty, and are remarkably forward in their conſtitution) are not poſſeſſed of that bright genius and noble ſpirit of emulation, which particularly characterizes thoſe of our native climate; and this may be inferred from phyſical cauſes. "*Even the children of Europeans, " born in India, loſe the courage peculiar to their " own climate: for the heat of it may be ſo exceſſive, " as to deprive the body of all vigor and ſtrength; a " warm air relaxes and lengthens the extremes of the " fibres, of courſe diminiſhes their force and elaſticity, " and prevents the exertion of their ſeveral faculties: " the faintneſs is communicated to the mind, and ſcarce- " ly any puniſhment is ſo ſevere as mental employment." I do not pretend to deny them natural talents or emulation at all. I only wiſh to be underſtood, they do not poſſeſs them in ſo great a degree as the latter: and for that reaſon I think they ſhould be allowed a year or two more in their ſtudies, to make up for

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* Vide Monteſquieu's Spirit of Law, Vol. I, Book XIV. Chap. 1 and 2.

the deficiency, before they appear in the world, and enable them to do ſo with more credit to their relations and tutors.

If it did not exceed the limits of a Preface, and fly off too much from the ſubject of the work, I might ſay a great deal more on the impropriety of uſing children in their infancy to ſpeak the native languages, and by uſing them thus early to acquire an idiom ſo contrary to that of the Engliſh: that they are ſcarce ever able, (notwithſtanding all poſſible care and pains are taken) to get rid of it; whereas there would not be the leaſt fear of attaining it in proper time, by the conſtant hearing they have of it. I could likewiſe ſpeak of the bad effects of the extraordinary indulgences, with which ſome children are treated, and the unjuſt ſeverity with which others are puniſhed; theſe circumſtances are all againſt the maſter and the ſcholar; but Mr. Dilworth, in his little and elegant Eſſay prefixed to his Schoolmaſter's Aſſiſtant, has ſo well anticipated every thing I can poſſibly ſay on the ſubject, that I muſt refer my readers, who are curious to it, for their further information, while I take the liberty of aſſuring them, there is not a ſingle circumſtance he treats of, but is particularly applicable to the children of this country.

The inconveniencies attending the removal of children to Europe, are many. The time loſt in the paſſages there and back again, and the expences attending it, are ſo great, that it is much to be lamented, they cannot be immediately remedied. The practice is not now ſo general as it uſed to be; it is to be hoped, that improvements for the advantage of youth, will repeatedly continue to take place, which will in the end contribute to remóve the cauſes that has induced ſo many of the native youth to be ſent to Europe; a circumſtance, which from political views is well known to be generally exploded.

It is another cauſe of much concern, that there is ſcarce any opportunity of providing for our youth in any other line, but that which is derived from the uſe of the pen; and even that employment (from the very great numbers of the Natives, who are brought up for that line) is in ſome meaſure done away, as not being ſo eaſy to attain as formerly, and leſs beneficial. The ſituation in which moſt Europeans are in this country, who are here moſtly with a view of bettering their fortunes, puts it out of their power to do much good to thoſe, who are placed with them: ſo that the youth who is bound apprentice to them, as ſoon as their maſter has accompliſhed his views, is turned over to ſerve the remainder of his time to a ſucceſſor, who thinks himſelf under no obligation to provide for him, when it is expired; and thus the youth is turned out on the world again, perhaps without any proſpect of benefiting in any other kind of life. Motives of pride may reſtrain him from mixing with the common herd of mechanicks, I mean the natives; and as his labour can be no more than that of one man, very few will be found willing to grant him a ſalary, which he thinks adequate to his deſerts, or as being of a claſs diſtinct from the Bengalees, when their labour is to be procured on ſuch low terms. As the deſcendants of Europeans are now daily encreaſing, and no proſpect to parents of providing for their children in any eligible ſituation, the matter may be conſidered in a very alarming light: it is therefore much to be wiſhed, that ſome plan could be pointed out to provide for the riſing generation, and ſome encouragement given to thoſe, who have it in their power to employ them. It belongs to abler heads, than mine, to determine the point, but it is to be hoped a matter of ſuch great importance will ere long be taken into conſideration, to remedy the evil ſo generally complained of.

I hope there is no neceſſity of apologizing for laying theſe ſheets before the publick, or pleading the common ſubterfuge of Authors, that they would have been afraid to come forward, but at the particular ſolicitations of their friends. But I was perſuaded in my own mind, as well as thoſe whoſe judgement I could rely upon, more than my own, that if the Compendium was made publick, it would be of much greater uſe, than when reſerved for the benefit of my ſchool alone, on which account it was originally deſigned; and I ever thought it the indiſpenſible duty of every perſon, to conduce as far as in him lies, to the benefit of the ſociety in which they live, than by an oppoſite conduct acquire to the ſmesve the epithets of mean and ſelfiſh.

Arithmetical publications have ever been reckoned the moſt erroneous, that come from the preſs: the Author therefore hopes, that whatever overſights may have eſcaped him, his worthy Subſcribers, will generouſly excuſe, and kindly paſs over any imperfections, (which he does not pretend to ſay it is free from) with the ſame candour and good will, with which he aſſures them, the work was compoſed for them, when he informs them, that no pains or trouble has been ſpared to remove the obſcurity, elucidate the perſpicuity of the rules, and render this pleaſing ſcience as exact, and as eaſy to attain as poſſible.

JOHN THOMAS HOPE.

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NUMERATION

TEACHETH to read, and write numbers by their true value; and in common concerns extends only to 9 figures, divided into three even periods.

TABLE.

3d Period.			2d Period.			1ſt Period.		
C Millions.	X Millions.	Millions.	C Thouſands	X Thouſands.	Thouſands.	Hundreds.	Tens.	Units.
								9
							8	9
						7	8	9
					6,	7	8	9
				5	6,	7	8	9
			4	5	6,	7	8	9
		3,	4	5	6,	7	8	9
	2	3,	4	5	6,	7	8	9
1	2	3,	4	5	6,	7	8	9

3d Period.			2d Period.			1ſt Period.		
C Millions.	X Millions.	Millions.	C Thouſands.	X Thouſands.	Thouſands.	Hundreds.	Tens.	Units.
								1
							2	9
						3	8	7
					4,	8	9	4
				5	7,	7	7	8
			6	8	6,	4	4	3
		7,	7	7	5,	2	5	4
	8	8,	3	0	4,	4	8	7
9	2	9,	9	4	7,	5	3	9

ADDITION

TEACHETH to bring ſeveral particular numbers into one total ſum, called Simple Addition, when the numbers are of one ſignification; and Compound, when of different names.

Note. + Saint George's Croſs ſignifies Plus, or Addition; as 4 + 2 = 6; *i. e.* 4 more 2, are equal to 6: the lines between 2 and 6, denoting equality.

Note. All Rules and Tables ſhould be perfectly learned by heart by the young practitioner, before he is allowed to enter into them, which is eſſentially neceſſary for the eaſy performance of them.

RULE.

TO add any ſums together, obſerve that the figures are placed regularly under each other, thus, units under units, tens under tens, &c.; then begin at the unit's place, and add the loweſt figure in that place to that above it, then add their ſum to the next figure in the ſame place, and ſo on to the top:—ſet down the overplus above ten or tens, and for every ten carry one to the next place: ſo proceed from place to place to the laſt, and ſet down the whole ſum of the laſt place.

To prove Addition, reckon the figures downwards, and if the ſum proves the ſame, you may ſuppoſe it to be right.

Ind. *TABLE.* Ind.

Index	0	1	2	3	4	5	6	7	8	9	0
	1	2	3	4	5	6	7	8	9	10	1
	2	3	4	5	6	7	8	9	10	11	2
	3	4	5	6	7	8	9	10	11	12	3
	4	5	6	7	8	9	10	11	12	13	4
	5	6	7	8	9	10	11	12	13	14	5
	6	7	8	9	10	11	12	13	14	15	6
	7	8	9	10	11	12	13	14	15	16	7
	8	9	10	11	12	13	14	15	16	17	8
	9	10	11	12	13	14	15	16	17	18	9
	10	11	12	13	14	15	16	17	18	19	10
	11	12	13	14	15	16	17	18	19	20	11
	12	13	14	15	16	17	18	19	20	21	12
	13	14	15	16	17	18	19	20	21	22	13
	14	15	16	17	18	19	20	21	22	23	14
	15	16	17	18	19	20	21	22	23	24	15
Index	0	1	2	3	4	5	6	7	8	9	0

Read thus, 1 and 1 are 2, 1 and 2 are 3, 1 and 3 are 4, &c.

(1) Maunds.	(2) Seers.	(3) Chittacks.	(4) Days.
892	964	827	348
736	527	802	951
841	318	956	630
260	874	172	824
594	659	359	741
371	271	841	627
895	634	942	548
4589	4247	4899	4669

(5 Cubits.	(6) Tolahs.	(7) Cofs.	(8) Ghurries.
9457	5942	6042	5402
6305	6000	7509	946
912	7459	3517	3514
418	8076	6954	9028
6037	9583	3274	6073
5192	8274	1192	5402
6059	9650	7684	9999
34380	54984	36172	40364

(9) Rupees.	(10) Annas.	(11) Pies.	(12) Cowries.
94627	72412	984127	8402769
7194	6389	721648	504218
8246	40897	282752	764123
91639	7034	100096	594180
81745	29188	69534	027514
9687	6536	748978	328111
91423	98669	632809	920847
384561	261125	3612914	12141762

SUB-

SUBSTRACTION

TEACHETH to take a leſs number from a greater, to ſhew the difference between both.

Note. A ſtraight line ſignifies Minus, or Subſtraction, as 4 — 2 = 2, *i. e.* 4 leſs 2 are equal to 2.

RULE.

PLACE the leſs number under the greater, units under units, tens under tens, &c. as in Addition: then begin with the unit figure of the leſs number, and put down the difference between it and the figure above it, exactly underneath; but if the lower figure is greater than the upper, add the difference between it, and 10 to the upper number; put down the unit figure of that ſum, and add one to the next loweſt number, and ſo proceed through the whole row, but without adding one, when in the two foregoing figures the upper number is greater than the lower.

To prove Subſtraction, add the remainder to the leſs number, and if the ſum proves the ſame as the greater, it is right.

Ind.

TABLE.

Index.	0	1	2	3	4	5	6	7	8	9	10
	1	0	1	2	3	4	5	6	7	8	9
	2		0	1	2	3	4	5	6	7	8
	3			0	1	2	3	4	5	6	7
	4				0	1	2	3	4	5	6
	5					0	1	2	3	4	5
	6						0	1	2	3	4
	7							0	1	2	3
	8								0	1	2
	9									0	1

Read thus, 1 from 1 nought, 1 from 2 one, &c.

1.	From	94607258	2. Borrowed	78406954
	Take	4690423	Paid	36917923
	Remains	89916835	Owing	41489031
	Proof	94607258	Proof	78406954

3. 94627196 — 8409563 = 86217633
4. 85734874 — 7509374 = 78225500
5. 6893476 — 3476370 = 3417106
6. 3487568 — 1973874 = 1513694
7. 8309587 — 583457 = 7726130
8. 7438678 — 483589 = 6955089
9. 45963872 — 95842 = 45868030
10. 64095724 — 53274161 = 10821563
11. 90876459 — 70095876 = 20780583
12. 65009007 — 9784278 = 55224729

MUL-

MULTIPLICATION

IS a ſhort way of performing ſeveral Additions. Note. Saint Andrew's Croſs × denotes Multiplication, as 4 × 2 = 8, *i. e.* 4 multiplied by 2 are equal to 8.

RULE.

PLACE the leaſt number under the greateſt as before directed, then begin with the firſt figure of the lower number, which is called the multiplier, and multiply it into the firſt figure of the upper number, which is called the multiplicand; ſet down the product if leſs than ten; but if more than ten, or tens, ſet down the overplus, and add the tens to the product of the next figure in the multiplicand, and ſo on till all the figures in the multiplicand are multiplied. Proceed in the ſame manner with each figure in the multiplier, ſetting down the firſt figure of each product exactly under its multiplying figure, then add all the products together.

To prove Multiplication, change the multiplicand and multiplier one for the other, and if the product proves the ſame, it is right.

TABLE.

Twice	2	are	4	5 Times	11	are	55
	3	—	6		12	—	60
	4	—	8		16	—	80
	5	—	10	6 Times	6	are	36
	6	—	12		7	—	42
	7	—	14		8	—	48
	8	—	16		9	—	54
	9	—	18		10	—	60
	10	—	20		11	—	66
	11	—	22		12	—	72
	12	—	24		16	—	96
	16	—	32	7 Times	7	are	49
3 Times	3	are	9		8	—	56
	4	—	12		9	—	63
	5	—	15		10	—	70
	6	—	18		11	—	77
	7	—	21		12	—	84
	8	—	24		16	—	112
	9	—	27	8 Times	8	are	64
	10	—	30		9	—	72
	11	—	33		10	—	80
	12	—	36		11	—	88
	16	—	48		12	—	96
4 Times	4	are	16		16	—	128
	5	—	20	9 Times	9	are	81
	6	—	24		10	—	90
	7	—	28		11	—	99
	8	—	32		12	—	108
	9	—	36		16	—	144
	10	—	40	10 Times	10	are	100
	11	—	44		11	—	110
	12	—	48		12	—	120
	16	—	64		16	—	160
5 Times	5	are	25	11 Times	11	are	121
	6	—	30		12	—	132
	7	—	35		16	—	176
	8	—	40	12 Times	12	are	144
	9	—	45		16	—	192
	10	—	50	16 Times	16	are	256

Read thus, twice 1 are 2, twice 2 are 4, &c.

(1) Multiplicand 45396729
Multiplier 5

Product 226983645

Proof.
5
45396729

45
10
35
30
45
15
25
20

226983645

(2) 947632195
17 } Factors.

1610974723 Fact.

(3) 749136148
61

45697305028

(4) 60479638
98

483837104
544316742

5927004524

(5) 86438729
8765

432193645
518632374
605071103
691509832

757635459685

(6) 97304808 × 3893 = 378807617544
(7) 30048187 × 974500 = 29281958231500
(8) 104874 83 × 109870 = 11522597572 10
(9) 97487300 × 98358 = 9588655853400
(10) 100896 49 × 584890 = 59013348 03610
(11) 97008583 × 78398 = 7605278890034
(12) 83485789 × 934876 = 78048860477164

DIVISION

IS a ſhort way of performing ſeveral Subſtractions, and ſhews how often one number is contained in another, and what remains.

Note I. ÷ ∺ a line between two or four points, is the ſign of Diviſion, as 4 ÷ 2, or 4 ∺ 2 = 2, *i. e.* 4 divided by 2 are equal to 2.

II. The reverſed parentheſis alſo denotes Diviſion, 2) 4 (2.

III. Numbers thus $\frac{412}{62}$ denote Diviſion, the lower number being the diviſor, and the upper number the dividend.

SHORT DIVISION.

RULE.

PLACE the diviſor, or leſs number to the left of the dividend, or greater number; conſider what number, multiplying the diviſor, will produce a product equal to the firſt, or firſt and ſecond numbers, or a product next leſs than them, which will be the quotient figure ſought; add the overplus to the next figure, and ſo proceed to the end of the line.

To prove Diviſion, multiply the quotient by the diviſor, to the product add the remainder, and if it proves the ſame as the dividend, it is right.

Dividend,
Diviſor, ... 2)729860123(1 Remainder.

Quotient, ... 364930061
2

729860123 Proof.

(2.) $74623894 \div 3 = 24874631\frac{1}{3}$
(3.) $94356879 \div 4 = 23589219\frac{3}{4}$
(4.) $84489521 \div 5 = 16897904\frac{1}{5}$
(5.) $38754893 \div 6 = 6459148\frac{5}{6}$
(6.) $104348986 \div 700 = 149069\frac{686}{700}$
(7.) $93846894 \div 8 = 11730861\frac{6}{8}$
(8.) $34895678 \div 90 = 387729\frac{68}{90}$
(9.) $45804894 \div 11 = 4164081\frac{3}{11}$
(10.) $58948970 \div 120 = 491241\frac{50}{120}$
(11.) $70089487 \div 16 = 4380592\frac{15}{16}$
(12.) $94265389 \div 160 = 589158\frac{103}{160}$

LONG DIVISION.

RULE.

PLACE the diviſor to the left of the dividend as before. Seek how often the firſt figure of the diviſor is contained in the firſt, or firſt and ſecond figures of the dividend, then multiply the diviſor by that figure. If the product ſhould be greater than an equal number of figures in the dividend, take one figure leſs for a quotient figure, and place it to the left of the dividend. Subſtract the product of that figure, and the diviſor, from the firſt equal number of figures in the dividend, and to the remainder bring down the next figure of the dividend, proceeding as before till they are all brought down, and prove it as directed in Short Diviſion.

Dividend.
Diviſor 984)41268193(41939 Quotient.
3936

.1908
984

9241
8856

.3859
2952

.9073
8856

217 Remainder.

41939
984

167756
335512
377451
217

Proof 41268193

(2)	890057644÷	97=	9175852	Remaind.
(3)	980348521÷	860=	1139940	121
(4)	187483897÷	539=	347836	293
(5)	107636216÷	4028=	26722	
(6)	248750089÷	6074=	40953	1567
(7)	874389789÷	92500=	9452	79789
(8)	484873807÷	8473=	57225	6382
(9)	248763448÷	71580=	3475	2294
(10)	809336108÷	48764=	16597	
(11)	78048860477164÷	83485789=	934876	
(12)	378807617544÷	97304808=	3893	

TABLE I. — *Of Bengal Money.*

2 Large Pice, P. make 1 Anna, A.
16 Annas...................... 1 Sicca Rupee. Sa. Rs.
16 Sicca Rupees............ 1 Gold Mohur. G. M.
100 Sicca Rupees, = 116 Current Rupees, Crs.

an imaginary coin, in which accounts are kept in Bengal, of which the Europeans reckon 12 pice to the anna, and 16 annas to the rupee; but the natives reckon only 4 pice to the anna, each equal to 5 gundas.

N. B. Cowries, or ſmall ſhells uſed in the bazars, for payment of coolies, &c. are reckoned thus:

4 Cowries .... make .... 1 Gunda.
20 Gundas .... 1 Pon.
16 Pon .... 1 Cawn.
4 Cawn .... 1 Rupee.

But theſe riſe and fall in their value, according to the plenty, or ſcarcity of them.

TABLE II. — *Of Engliſh Money.*

4 Farthings, Q. ...... make ...... 1 Penny. D.
12 Pence .... 1 Shilling. S.
20 Shillings, ... 1 Pound Sterlg. £.
6 Pence .... ½ a Shilling.
30d. or 2s. 6d. .... ½ a Crown.
60d. or 5s. .... 1 Crown.
10s. 6d. .... a Guinea.
21s. or 1l. 1s. .... 1 Guinea.

Accounts are kept in England in pounds, ſhillings, pence and farthings, the latter of which are ſet down thus:

Farthings. 1 = ¼ a Quarter.
2 = ½ a Half.
3 = ¾ 3 Quarters.

TABLE III. — *Of Bazar Weight.*

5	Siccas, or quarter rupees, S. make	1 Khanchah. K.
4	Khanchah	1 Chahtack. C.
4	Chahtacks	1 Pouah. P.
4	Pouah, or 16 Chahtacks	1 Seer. S.
5	Seers	1 Patcherry. P.
8	Patcherries, or 40 Seers	1 Maund. Md.

1 Bazar Md. is equal to $82\frac{1}{8}$ ℔ nearly.

TABLE IV. — *Of Avoirdupois Weight.*

16	Drams, d. ... make	1 Ounce. oz.
16	Ounces,	1 Pound. ℔
28	Pounds,	1 Quarter. qr.
4	Quarters, or 112 lb.	1 Hundred Weight. cwt.
20	Hundred Weights,	1 Ton. tn.

TABLE.

TABLE V. — *Of Gold and Silver Weights.*

4 Punkho or quarter grains, make	1 Dhan or Grain.	D.
4 Dhan,	1 Rutty.	R.
6¼ Rutty,	1 Anna.	A.
8 Rutty,	1 Maſſa.	M.
100 Rutty, or 12½ Maſſa, or 16 As.	1 Tolah, or S. R.	T.
106¼ R. or 13,28125 M. or 17 As.	1 Gold Mohur.	G.M.

dwts. grains.

A Gold Mohur = 7 - 22$\frac{9}{10}$ Troy.

A Sicca Rupee = 7 - 11$\frac{2}{3}$ Troy.

TABLE VI. — *Of Troy Weight.*

24 Grains, G. ... make ...	1 Penny Weight.	dwt.
20 Penny Weights	1 Ounce.	oz.
12 Ounces	1 Pound.	℔ Troy.

TABLE VII. — *Of Bengal Doctor's Weights.*

4 Jorbe, J. .... make	1 Rutty.	Ry.
5 Rutty,	1 Mhan.	Mn.
2 Mhan,	1 Maſſa.	Ma.
2 Maſſa,	1 Tolah, = 1 S. R.	

TABLE VIII. — *Of Apothecaries Weight.*

12 Grains, G. .... make	1 Scruple.	℈
3 Scruples,	1 Dram.	ʒ
8 Drams,	1 Ounce.	℥
12 Ounces,	1 Pound.	℔

TABLE IX. — *Of Grain Meaſure.*

5 Chahtacks, C.	make	1 Khoonkee. K.
4 Khoonkee,		1 Rak. R.
4 Rak,		1 Pally. Py.
20 Pally,		1 Soallee. Se.
16 Soallee,		1 Khahoon = 40 Mds.

TABLE X. — *Of Dry Meaſure.*

2 Pints P.	make	1 Quart. Qt.
2 Quarts		1 Pottle. Pot.
2 Pottles		1 Gallon. Gal.
2 Gallons		1 Peck. P.
2 Pecks		1 Buſhel.
4 Buſhels		1 Sack. S.
8 Buſhels		1 Quarter. Qr.
10 Quarters		1 Wey. W.
12 Weys		1 Laſt. L.

TABLE XI. — *Of Bengal Liquid Meaſure.*

5 S. Rs Weight of Liquid	make	1 Chahtack. C.
4 Chahtacks		1 Pouah. P.
4 Pouah		1 Seer. S.
40 Seers		1 Maund. Md.

TABLE XII. — *Of Engliſh Liquid Meaſures.*

For Wine, Spirits, &c.

2 Pints, P. make	1 Quart. Qt.
4 Quarts	1 Gallon. Gall.
10 Gallons	1 Anchor of Rum or Brandy.
18 Gallons	1 Runlet. Rt.
31½ Ditto	1 Barrel. Bl.
42 Ditto	1 Tierce. Tce.
63 Ditto	1 Hogſhead. Hhd.
84 Ditto, or 2 Tierces	1 Puncheon. Pn.
2 Hogſheads, or 4 Barrels	1 Pipe. Pe.
2 Pipes, or 4 Hhds.	1 Tun. Tn.

For Beer and Ale.

2 Pints, P. ... make	1 Quart. Qt.
4 Quarts	1 Gallon. Gal.
8 Gallons	1 Firkin of Ale. F. A.
9 Gallons	1 Firkin of Beer. F. B.
2 Firkins	1 Kilderkin. Kn.
2 Kilderkins	1 Barrel. Bl.
1½ Barrel, or 54 Gallons	1 Hogſhead of Beer. H.B.

TABLE XIII. — *Of Bengal Long Meaſure.*

3 Grains in length G. make	1 Finger's Breadth. Fs.
4 Fingers	1 Hand. Hd.
3 Hands	1 Span. Sn.
2 Spans	1 Arm or Cubit. Am.

4	Arms	1 Fathom. Fm.
1000	Fathoms, or 4000 Cubits,	1 Coſs or Bengal Mile equal to 1 Engliſh Mile, 1 Furlong, 3 Poles, and 3½ Yards,
2	Coſs, C. ... make ...	1 Ghoorbutty. Ghy.
2	Ghoorbutty	1 Jozun. Jn.
100	Jozun	1 Mundulh. Ml.
100	Mundulh	1 Condooh. Ch.
100	Condooh	1 Gundulh. Gh.
100	Gundulh	1 Madonie, or Circumference of the World.

TABLE XIV.—*Of Engliſh Long Meaſure.*

3	Barley Corns, B.C. make	1 Inch. In.
4	Inches	1 Hand. Hd.
12	Inches	1 Foot. Ft.
3	Feet	1 Yard. Yd.
6	Feet	1 Fathom. Fm.
5½	Yards	1 Rod, Pole, or Perch. P.
40	Poles	1 Furlong. Fg.
8	Furlongs	1 Mile. Me.
3	Miles	1 League. Lge.
60	Miles, or 20 Leagues	1 Degree. Degr.

A Degree is 69 Miles and 4 Furlongs, very near, though commonly reckoned but 60 Miles.

TABLE XV.—*Of Bengal Cloth Meaſure.*

3 Jorbe, J. make 1 Angullae. Ae.
3 Angullae .... 1 Gheria. Ga.
8 Gheria, ... 1 Haat or Cubit, = 18 Inches.
2 Haat .... 1 Guz, equal to 1 Yard.

TABLE XVI.—*Of Engliſh Cloth Meaſure.*

2¼ Inches, In. ...... make ...... 1 Nail. Nl.
4 Nails .... 1 Quarter. Qr.
3 Quarters .... 1 Ell Flemiſh. E. F.
4 Quarters .... 1 Yard. Yd.
5 Quarters .... 1 Ell Engliſh. E. E.

TABLE XVII.—*Of Bengal Land Meaſure.*

3 Jorbe, Je. ... make ... 1 Angullae, Ae.
4 Angullae .... 1 Muttihe. Mut.
3 Muttihe .... 1 Begot. Bt.
2 Begot .... 1 Haat or Cubit, equal to 18 Inches.
324 Inches .... 1 Square Cubit. Sq. Ct.
5 Cubits long and 4 broad, or 20 Square Cubits,... 1 Chahtack. Ck.
16 Chahtacks, or 30 Cubits long and 4 broad, or 320 Square Cubits, ... 1 Cottah. Cot.
20 Cottahs, or 80 Cubits Square, or 6400 Square Cubits .... 1 Biggah. B.

1 Biggah is equal to 529 perches nearly, or rather more than one-thirtieth part of an acre.

TABLE XVIII. — *Of Engliſh Land Meaſure.*

144 Square Inches, Sq. In. ... make ...	1 Foot. Ft.
9 Square Feet	1 Yard. Yd.
30 Yards and a quarter	1 Pole. Pe.
40 Poles in length and 1 in breadth ...	1 Rood. Rd.
4 Roods	1 Acre. Ac.

TABLE XIX. — *Of Bengal Time.*

18 Pollock, or winks of the eye, P. make	1 Coſtah. Ch.
30 Coſtah	1 Kollah. Kh.
30 Kollah	1 Onoo Poll. O. Pl.
60 Onoo Poll	1 Be Poll. B. Pl.
60 Be Poll	1 Poll. Pl.
60 Poll	1 Ghurrie=24 Minutes. Gh.
7½ Ghurrries	1 Phaur = 3 Hours. Ph.
8 Phaur, or 60 Ghurries	1 Day = 24 Hours. Dy.
7 Days	1 Saufta. Sa.
15 Days	1 Puhkee. Pu.
2 Puhkee	1 Mos. Ms.
2 Mos	1 Rhetoo. Rho.
6 Rhetoo	1 Bhatſarrh, or Year. Bh.
12 Bhatſarrh	1 Joog. Jg.
71 Joog	1 Mundun terrah. M.

TABLE XX. — *Of Engliſh Time.*

60 Seconds, Sec. ...... make ...... 1 Minute. Me.
60 Minutes .... 1 Hour. Hr.
24 Hours .... 1 Day. Dy.
7 Days .... 1 Week. Wk.
4 Weeks .... 1 Month. Mo.
13 Months 1 day 6 hours, or 365¼ days 1 Julian Year. Jn. Yr. But the exact ſolar year is 365 days, 5 hours, 49 minutes, 4 ſeconds and $\frac{1}{3}$; and the lunar month is 29 days, 12 hours and 45 minutes.

Thirty days hath September,
April, June and November;
February hath twenty-eight alone,
And all the reſt hath thirty-one.

TABLE XXI. — *Of things reckoned by the Tale in Bengal.*

4 Particulars ...... make ...... 1 Gunda. Gnd.
5 Gundas .... 1 Coorie or Corge.

TABLE XXII. — *Of things reckoned by the Tale in England.*

12 Particulars, P. ... make 1 Dozen. Dn.
20 Ditto .... 1 Score. Src.
12 Dozens .... 1 Groſs. Gs.
12 Groſs, or 144 Dozens 1 Great Groſs. Gr. Gs.

TABLE XXIII.

60 Seconds .... make .... 1 Minute. '
60 Minutes .... 1 Degree. °
30 Degrees .... 1 Sign. Sn.

12 Signs, or 360 Degrees, make the whole great circle of the Zodiac.

MONEY TABLES.

Pice		Ans.	Ps.
12	are	1	0
20	—	1	8
24	—	2	0
30	—	2	6
36	—	3	0
40	—	3	4
48	—	4	0
50	—	4	2
60	—	5	0
70	—	5	10
72	—	6	0
80	—	6	8
84	—	7	0
90	—	7	6
96	—	8	0
100	—	8	4
108	—	9	0
110	—	9	2
120	—	10	0
130	—	10	10
132	—	11	0
140	—	11	8
144	—	12	0
150	—	12	6
156	—	13	0
160	—	13	4
168	—	14	0
170	—	14	2
180	—	15	0
190	—	15	10
192	—	16 or	1 R.

Annas.		Rs.	As.
16	are	1	0
20	—	1	4
30	—	1	14
32	—	2	0
40	—	2	8
48	—	3	0
50	—	3	2
60	—	3	12
64	—	4	0
70	—	4	6
80	—	5	0
90	—	5	10
96	—	6	0
100	—	6	4
110	—	6	14
112	—	7	0
120	—	7	8
128	—	8	0
130	—	8	2
140	—	8	12
144	—	9	0
150	—	9	6
160	—	10	0
170	—	10	10
176	—	11	0
180	—	11	4
190	—	11	14
192	—	12	0
200	—	12	8
208	—	13	0
210	—	13	2

PARTICULARS OF MONEY.

Specie — — — —	A GUINEA.
Aſſay. — — — —	22 Carats fine, or 118,6517 gr. pure gold.
Alloy. — — — —	2 Carats, or 10,7865 gr. alloy.
Weight Troy. — — —	24 Parts, or 129,4382 gr. weight.
Number to lb. Troy. —	44,5
Equal *in* Sterling Money.	1l. 1s.

Specie. — — — —	A GOLD MOHUR.
Aſſay. — — — —	23 3¾ Carats fine, or 190,398 gr. pure,
Alloy. — — — —	0 0¼ Carats, or ,497 gr. alloy.
Weight Troy. — — —	24 Parts, or 190,895 gr. weight.
Number to lb. Troy. —	30,173.
Equal in Sterling Money.	1l. 13s. 8d. ¼ ½ .

Specie. — — — —	A PAGODA.
Aſſay. — — — —	19 gr. 0$\frac{4}{5}$ qrs. carats fine, or 42,048 gr. pure
Alloy. — — — —	4 gr. 3$\frac{1}{5}$ qrs. carats, or 10,512 gr. alloy.
Weight Troy. — — —	24 Parts, or 52,56 gr. weight.
Number to lb. Troy. —	109,589.
Equal in Sterling Money.	7s. 5d. ¼ $\frac{1}{5}$

Specie. — — — —	A RUPEE.
Aſſay. — — — —	11 oz 15 dwts fine, or 175,923 gr. pure ſilv.
Alloy. — — — —	5 dwts. or 3,743 gr. alloy.
Weight Troy. — — —	12 oz. whole parts, or 179,666 gr. weight.
Number to lb. Troy. —	32,06 nearly.
Equal in Sterling Money.	2s. 0,5659d.

Specie. — — — —	A SHILLING.
Aſſay. — — — —	11 oz. 2 dwts. fine, or 85,935 gr. pure ſilver
Alloy. — — — —	18 dwts. or 6,968 gr. alloy.
Weight Troy. — — —	12 oz. whole parts, or 92,903 gr. weight.
Number to lb. Troy. —	62.
Equal in Sterling Money.	1s.

COM-

COMPOUND ADDITION.

RULE.

PLACE each denomination of the different numbers to be added together, exactly under each other, and divide the ſum of the firſt denomination to the right by whatever number of that denomination makes one of the next, ſetting down the remainder, and carrying the quotient figure to the next denomination, and ſo proceed till the whole is finiſhed.

Prove theſe ſums as directed in Simple Addition.

(1)

S. Rs.	A.	P.
912	14	9
714	11	2
119	13	1
67	10	11
45	0	0
936	9	8
724	15	6
3521	11	1

(2)

C. R.	A.	P.
874	14	4
65	2	2
32	0	7
59	15	0
731	12	8
60	9	9
114	13	3
1939	3	9

(3)

L.	S.	D.
914	10	11¼
78	14	9½
69	11	8¾
18	0	4
14	19	6¼
19	11	10½
28	9	3
1143	18	5¼

(4)

L.	S.	D.
1000	19	11¾
987	18	9¼
385	10	8
109	11	3½
74	9	4¾
60	4	10½
59	11	4½
2678	6	4

(5)

(5) Mds.	Srs.	Chs
114	14	9
16	29	14
19	18	13
14	27	7
17	13	0
14	32	8
16	9	11
213	25	14

(6) Mds.	Srs.	Chs.
119	14	10
27	20	9
25	14	4
32	19	8
35	27	7
62	19	6
8	16	9
311	12	5

(7) T.	Cwts.	Qrs.	℔.
1	3	2	12
1	14	2	21
1	12	1	14
1	19	3	0
1	14	1	4
1	19	0	19
1	0	0	9
11	3	3	23

(8) Qrs.	℔.	Oz.	Dms.
2	14	10	9
7	3	9	0
1	21	14	6
2	27	9	0
3	0	13	7
2	14	10	2
6	19	10	9
26	18	13	1

(9) Tol.	Rut.	Dhan.
20	90	3
18	60	2
50	20	0
16	14	1
15	28	2
10	98	3
12	40	0
144	52	3

(10) Tol.	Rut.	Dhan.
19	80	2
9	20	1
8	14	1
6	77	0
5	29	3
3	40	1
4	62	0
57	24	0

(11)	℔.	Oz.	Dwt.	Grs.
	180	11	18	23
	1[illegible]0	9	10	19
	119	10	11	18
	10	8	7	15
	18	4	8	17
	63	9	19	8
	34	3	5	9
	5[illegible]8	10	2	13

(12)	℔.	Oz.	Dwt.	Grs.
	100	9	18	12
	97	10	14	20
	34	11	17	19
	10	3	15	16
	9	6	12	22
	7	7	9	9
	18	2	8	0
	279	4	18	2

(13)	Lea.	M.	F.	P.
	18	2	7	30
	11	1	3	12
	10	0	7	39
	9	2	6	9
	3	1	1	18
	5	0	4	10
	1	2	3	3
	61	0	2	1

(14)	Yds.	Ft.	In.	B.C.
	1	2	11	2
	3	1	9	1
	5	0	7	0
	10	1	4	2
	19	2	3	2
	17	1	2	1
	4	1	10	0
	63	0	0	2

(15)	Tn.	Pip.	Hhd.	Gal.
	1	1	1	60
	2	1	0	18
	4	1	1	19
	3	0	0	11
	8	1	1	9
	3	0	0	7
	1	1	1	20
	26	0	0	18

(16)	Hhd.	Gal.	Qts.	Pts.
	1	19	3	1
		20	2	0
	1	13	2	1
	1	17	0	0
	1	7	1	0
	1	14	3	1
		4	2	1
	6	34	3	0

(17)

(17)	Guz.	Haat.	Ghe.
	6	1	5
	12	1	4
	10	0	6
	7	1	7
	8	0	3
	16	0	0
	20	1	6
	82	1	7

(18)	Yds.	Cub.	In.
	8	1	14
	10	0	12
	6	0	10
	3	1	8
	4	1	6
	2	1	4
	1	0	17
	37	1	17

(19)	E. E.	Qrs.	Nls.
	1	1	0
	9	3	3
	4	0	0
	7	1	2
	3	4	1
	8	1	3
	4	1	0
	38	3	1

(20)	Yds.	Qrs.	Nls.
	1	3	3
		1	1
	4	0	1
	3	2	2
	1	1	0
	1	0	3
		2	3
	13	0	1

(21)	Yrs.	M.	W.	D.
	1	11	3	4
	3	10	2	5
	14	7	2	3
	7	3	0	6
	3	7	3	0
	8	1	2	4
	9	4	3	3
	48	8	2	4

(22)	D.	H.	M.	Sec.
	6	20	20	50
	3	19	49	17
	7	10	30	15
	2	17	18	20
	8	14	10	25
	10	12	50	10
	5	13	34	16
	45	12	33	33

(23)	S.	o.	'	"
	2	20	45	15
	1	15	34	45
	1	18	50	25
		21	30	30
	3	12	45	50
	1	24	40	12
		29	59	59
	12	24	6	56

(24)	S.	o.	'	"
	1	8	52	30
		10	15	20
	2	8	12	25
	1	12	30	48
	1	15	30	33
	2	6	50	19
	1	8	14	45
	10	10	26	40

COMPOUND SUBSTRACTION.

RULE.

PLACE each denomination under its own kind. Subſtract the loweſt denomination to the right from its upper number, if greater than it; but from as many of that denomination as make one of the next ſuperiour, if leſs; and to the remainder add the upper number, carrying one to the next denomination, and thus proceed from one to the other; but omit to add 1 to them, when the upper number of the preceding is greater than the lower.

Prove theſe ſums as directed in Simple Subſtraction.

(1) From 945 Cr. Rs. 10 A. 3 P. take 734 Cr. Rs. 12 A. 5 P.

	Cr. Rs.	A.	P.
	945	10	3
	734	12	5
Remains	210	13	10
Proof	945	10	3

(2)

(2) C. Rs. A. P. C. Rs. A. P. C. Rs. A, P.
950 9 4 — 645 0 9 = 305 8 7

(3) l. s. d. l. s. d, l. s. d.
849 14 5¼ — 736 19 8½ = 112 14 8¾

(4) mds frs. chs. mds. frs. chs. mds. frs. chs.
840 19 13 — 751 12 15 = 89 6 14

(5) T. cwts. qrs. lb. T. cwts. qrs. lb. cwts. qrs. lb.
2 14 2 14 — 2 5 2 21 = 8 3 21

(6) lb. oz. dms. lb. oz. dms lb. oz. dms.
747 0 15 — 65 10 2 = 881 6 13

(7) lb. oz. dwt. grs. lb. oz. dwt. grs. lb. oz. dwt. grs.
9 0 14 5 — 4 5 10 12 = 4 7 3 17

(8) degs. lea. m. f. degs. lea. m. f. degs. lea. m. f.
9 2 1 4 — 4 3 0 5 = 4 19 0 7

(9) yds. ft. in. b.c. yds. ft. in. b.c. yds. ft. in. b.c.
9 2 0 1 — 7 0 7 2 = 2 1 4 2

(10) e.e. qrs. nls. e.e. qrs nls. e.e. qrs. nls.
75 3 0 — 60 3 2 = 14 4 2

(11) yds. qrs. nls. yds. qrs. nls. yds. qrs. nls.
10 2 2 — 8 3 0 = 1 3 2

(12) e. f. qrs. nls. e. f. qrs. nls. e. f. qrs. nls.
75 0 2 — 42 0 3 = 32 2 3

(13) cubits inches. cubits inches. cubits. inches.
9402 8 — 7364 12 = 2037 14

(14) hhd. gal. qts. pts. hhd. gal. qts. pts. hhd. gal. qts. pts.
5 21 0 0 — 2 30 0 1 = 2 53 3 1

(15) yrs. m. w. d. yrs. m. w. d. yrs. m. w. d.
2 2 1 4 — 2 1 3 6 = 0 0 1 5

(16) d. h. m. sec. d. h. m. sec. d. h. m. sec.
14 2 25 30 — 10 2 9 45 = 4 0 15 45

COM-

COMPOUND MULTIPLICATION.

RULE.

PLACE the multiplier underneath the loweſt denomination of the multiplicand. Multiply each denomination of the multiplicand by the multiplier, and manage the products as directed in Compound Addition.

The beſt way to prove ſums in this rule, is (when the learner is acquainted with Compound Diviſion) to divide the product by the multiplier. If the quotient is the ſame as the multiplicand, it is right.

	C. Rs.	A.	P.	
(1) Multiply	95	10	9	by 2

	C. Rs.	A.	P.	
	95	10	9	
			2	
	191	5	6	Product.
2	95	10	9	Proof.

(2)	C. Rs.	A.	P.		C. Rs.	A.	P.
	84	5	4	× 4 =	337	5	4

(3)	l.	s.	d.		l.	s.	d.
	87	10	11¼	× 3 =	262	12	9¾

(4)	Mds.	Srs.	Chs.		Mds.	Srs.	Chs.
	95	10	11	× 5 =	476	13	7

(5)	T.	Cwts.	Qrs.	lb.		T.	Cwts.	Qrs.	lb.
	1	2	2	14	× 6 =	6	15	3	0

(6) lb. oz. drs. lb. oz. drs.
75 0 14 × 7 = 525 6 2

(7) lb. oz. dwt. grs. lb. oz. dwt. grs.
6 2 18 10 × 8 = 49 11 7 8

(8) degs. lea. m. f. degs. lea. m. f.
4 0 2 4 × 9 = 36 7 1 4

(9) yds. ft. in. b. c. yds. ft. in. b. c.
66 1 2 2 × 10 = 664 0 2 2

(10) hhd. gal. qts. pts. hhd. gal. qts. pts.
7 18 2 0 × 11 = 80 14 2 0

(11) e. e. qrs. nls. e. e. qrs. nls.
99 3 2 × 12 = 1195 2 0

(12) yds. qrs. nls. yds. qrs. nls.
110 0 2 × 16 = 1762 0 0

(13) yrs. m. w. d. yrs. m. w. d.
8 2 2 2 × 20 = 164 3 1 5

(14) d. h. m. sec. d. h. m. sec.
67 18 32 45 × 25 = 1694 7 38 45

(15) w. d. h. m. w. d. h. m.
2 6 20 50 × 28 = 83 3 7 20

(16) yrs. m. w. d. yrs. m. w. d.
30 10 2 5 × 32 = 986 3 2 6

COMPOUND DIVISION.

RULE.

PLACE the diviſor to the right of the dividend, as before directed. Divide the higheſt denomination by it, and multiply the remainder (if any) by as many of that denomination as make one of the next loweſt; to the product add the next denomination in the dividend, and divide as before.

To prove the work multiply the quotient by the diviſor. If the product is the ſame as the dividend, it is right.

(1) Divide C. Rs. A. P. 191 5 6 by 2

	C. Rs.	A.	P.	
2)	191	5	6	(no remainder.
	95	10	9	quotient.
			2	
	191	5	6	proof.

(2)	C. Rs.	A.	P.					C. Rs.	A.	P.
	85	10	9	÷	4	=		21	6	$8\frac{1}{4}$
(3)	l.	s.	d.					l.	s.	d.
	73	9	$11\frac{1}{4}$	÷	3	=		24	9	$11\frac{1}{4}$
(4)	mds.	frs.	chs.					mds.	frs.	chs.
	84	10	3	÷	5	=		16	34	$0\frac{3}{5}$
(5)	T. cwts.	qrs.	lb.					cwts.	qrs.	lb.
	1 2	2	14	÷	6	=		3	3	$2\frac{2}{6}$
(6)	lb.	oz.	dms.					lb.	oz.	dms.
	84	13	12	÷	7	=		12	0	$8\frac{4}{7}$
(7)	lb. oz.	dwt.	grs.					oz.	dwt	grs.
	2 0	14	8	÷	8	=		3	1	19
(8)	degs. lea.	m.	f.				degs.	lea.	m.	f.
	6 2	1	4	÷	9	=		13	1	$6\frac{6}{9}$

(9) yds. f. in. b. c. — f. in. b. c.
8 2 9 1 $\div$ 10 = 2 8 $0\frac{4}{10}$

(10) e. f. qrs. nls. — e. f. qrs. nls.
75 0 2 $\div$ 11 = 6 2 2

(11) cub. in. — cub. in.
7188 14 $\div$ 12 = 599 $1\frac{2}{12}$

(12) hhd. gal. qrs. pts. — gal. qts. pts.
7 14 1 1 $\div$ 16 = 28 1 $1\frac{11}{10}$

(13) yrs. m. w. d. — m. h. d.
9 2 3 4 $\div$ 25 = 4 3 $1\frac{3}{25}$

(14) d. h. m. ſec. — h. m. ſec.
7 10 14 29 $\div$ 31 = 5 44 59

(15) w. d. h. m. — h. m.
3 5 9 45 $\div$ 35 = 18 $6\frac{15}{35}$

(16) yrs. m. w. d. — m. w. d.
12 6 3 5 $\div$ 42 = 3 3 $3\frac{26}{42}$

REDUCTION

IS the reducing, or bringing numbers of one denomination into numbers of another denomination; but of the ſame value.

To change great names into ſmall *multiply*.

To change ſmall names into great *divide*, and whether you multiply or divide, it muſt be by as many of the ſmall, as make one of the great; and by reverſing the queſtion, you will find the proof.

(1) In 46 current rupees, how many pice?

C.Rs.
46
16

736 Annas.
12

Anſwer 8832 Pice.

This ſum is proved by the following queſtion:

(2) In 8832 pice, how many current rupees?

Pice.
12)8832

16)736 Annas.

Anſwer 46 Current Rupees.

(3) In 97 C. Rs. 8 A. 10 P. how many pice?

C.Rs. A. P.
97 8 10
16

1560 Annas.
12

Anſwer 18730 Pice.

(4) In 18730 pice, how many rupees?

Pice.
18730
12
a. 1560 10
16
Rupees 97 8 10 Anſwer.

(5)

(5) In 13 pounds, how many ſhillings, pence and farthings? Anſwer, 260 s. 3120 d. 12480 f.

(6) In 98 l. 12 s. 11 $\frac{3}{4}$, d. how many farthings? Anſwer, 94703 farthings.

(7) In 12480 farthings, how many pounds? Anſwer, 13 pounds.

(8) In 94703 farthings, how many pounds? Anſwer, 98 l. 12 s. 11 $\frac{3}{4}$ d.

(9) In 720 gold mohurs, how many annas? Anſwer, 184320 annas.

(10) Reduce 184320 annas into gold mohurs. Anſwer, 720 gold mohurs.

(11) A perſon ſent 500 gold mohurs to the mint, to be coined into 8-rupees, 4-rupees, 2-rupees and 1-rupee pieces, to receive an equal number of each; how many will he receive? Anſwer, 533 of each, and 5 rupees over.

(12) Twenty-five coolies laboured 12 days, for 3 annas each day, what is the amount of their pay in rupees? Anſwer, 56 rupees, 4 annas.

(13) In a ſircar's eſcritoir there are 914 gold mohurs, 432 pagodas, at 3 ſicca rupees 12 annas each, 2000 ſicca rupees, and 1600 pice 32 to the rupee, what is the amount in rupees? Anſwer, 18294 rupees.

(14) In 7 cwt. 3 qrs. 10 lb. how many ounces? Anſwer, 14048 ounces.

(15) In 3 tons of iron, how many pounds? Anſwer, 6720 pounds.

(16) In 6720 lb. of iron, how many tons? Anſwer, 3 tons.

(17) In 14048 ounces, how many hundred weights? Anſwer, 7 cwt. 3 qrs. 10 lb.

(18) In 10 bars of iron, each weighing 1 cwt. 3 qrs. 12 lb. how many pounds? Anſwer, 2080 lb.

(19) In 17 pigs of lead, each weighing 4 cwt. 3 qrs. how many pounds? Anſwer, 9044 pounds, in 17 pigs.

(20) In 90 maunds, how many chahtacks? Anſwer, 57600 chahtacks.

(21) In 57934 chahtacks, how many pouahs, ſeers and maunds? Anſwer, 90 maunds, 20 ſeers, 3 pouahs, 2 chahtacks.

(22) In 57600 chahtacks how many maunds? Anſwer, 90 maunds.

(23) In 90 mds. 20 ſrs. 3 po. 20 chs. how many chahtacks? Anſwer, 57934 chahtacks.

(24) Divide 25 maunds of rice among the poor, at 4 ſeers each, how many will it ſuffice? Anſwer, 250 perſons.

(25) In 960 maunds of rice, how many bags of rice, each 1 maund 35 ſeers? Anſwer, 512 bags.

(26) In 500 bags of rice, each 1 maund 35 ſeers, how many maunds? Anſwer, 937 maunds, 20 ſeers.

(27) In 47lb. 10 oz. how many grains? Anſwer, 275520 grains.

(28) In 275520 grains, how many pounds Troy? Anſwer, 47 lb. 10 oz.

(29) In 15 ſpoons, each 6 ſicca rupees 5 annas 3 pice, how many rupees weight? Anſwer, 94 ſicca rupees 14 annas 9 pice.

(30) In 17 ingots of ſilver, each weighing 27 oz. 10 dwt. how many grains? Anſwer, 224400 grains in 17 ingots.

(31) In 70 miles, how many poles? Anſwer, 22400 poles.

(32) In 40 yards, how many barley-corns? Anſwer, 4320 barley-corns.

(33) In 950400 barley-corns, how many miles? Anſwer, 5 miles.

(34) In 4000 inches, how many yards? Anſwer, 111 yards 4 inches.

(35) In 4 leagues, how many yards? Anſwer, 21120 yards.

(36) In 15840 yards, how many leagues? Anſwer, 3 leagues.

(37) How many barley-corns in a mile? Anſwer, 190080 barley-corns.

(38) How many barley-corns will reach round the globe of the Earth, which is 360 degrees, and each degree 69½ miles? Anſwer, 4755801600. barley-corns.

(39) In 17 gallons, how many pints? Anſwer, 136 pints.

(40) In 7056 quarts, how many hogſheads? Anſwer, 28 hogſheads.

(41) In 4 tuns of oil, how many quarts? Anſwer, 4032 quarts.

(42) In a pipe of wine, how many dozens, ſuppoſing each bottle to hold exactly a quart? Anſwer 42 dozens.

(43) In 17 yards 1 quarter 2 nails, how many nails? Anſwer, 278 nails.

(44) In 47128 nails of Iriſh cloth, how many pieces, each 12 yards? Anſwer, 245 pieces, each 12 yards, and 5 yards 2 quarters over.

(45) In 10 bales of cloth, each 12 pieces, each 25 yards, how many yards? Anſwer, 3000 yards.

(46) In 7000 nails of Holland, how many ells Engliſh? Anſwer, 350 ells Engliſh.

(47) Reduce 42 ells Engliſh into nails? Anſwer 840 nails.

(48) In 400 cubits, how many inches? Anſwer, 7200 inches.

(49) In 7200 inches, how many guz.? Anſwer, 200 guz.

(50) In 40 bales of cloth, each 50 pieces, each 20 cubits, how many cubits? Anſwer, 40000 cubits.

(51) In 120 pieces of cloth, each 34½ cubits, how many cubits? Anſwer, 4140 cubits.

(52) In 121812 ſeconds, how many hours? Anſwer, 33h. 50m. 12 ſec.

(53) Reduce 41 weeks into minutes? Anſ. 413280 minutes.

(54) In 200157 days, how many years? Anſwer, 548 years, 4 months, 2 weeks, 3 days.

(55) Reduce 413280 minutes into weeks? Anſwer, 41 weeks.

(56) How many ſeconds in a year, allowing it to be 365 days 6 hours? Anſwer, 31557600 ſeconds.

(57) How many times doth a regular clock ſtrike in a year? Anſwer, 56961 times.

(58) From March the 2d to November the 19th following, incluſive, how many days? Anſwer 263 days.

(59) How many days have paſſed ſince the birth of Chriſt to this day, it being the 1ſt of September, 1789? Anſwer, 653317 days.

(60) From the 6th of June 1682 to the 5th of Auguſt, excluſive, 1721, how many days, adding 9 days for the leap-years, being 1 day every 4 years? Anſwer, 14313 days.

THE SINGLE RULE OF THREE.

SO called from having three terms given in a queſtion to find a fourth, which bears the ſame proportion to the ſecond, whether more or leſs, as the third does to the firſt.

As in calculations of this kind, it ſometimes requires a particular regard to the placing of the terms in due order, obſerve the following rule:

Set down the quantity, that is of the ſame kind with the quantity ſought; then conſider, from the nature of the queſtion, whether that which is ſought, is greater or leſs, than that which is given—If it is greater, then place the greateſt of the other two quantities on the right hand; but if it is leſs, place the leaſt of the other two quantities on the right hand, and the other on the left; then will the terms be in due order, having the firſt, and third terms of the ſame quantity, which if they are not already of one name, muſt be reduced to the loweſt denomination mentioned in either of the terms.—The ſecond term, if not of one name only, muſt be reduced to its loweſt denomination mentioned, after which, by multiplying the ſecond and third terms together, and dividing the product by the firſt term, the quotient will be the fourth proportional ſought, of the ſame name with the ſecond term, which muſt be reduced to the denomination required.

Note I. Numbers pointed thus, 2 : 4 : : 8 : 16 denote them to be proportional one to another, by the Rule of Three.

II. To prove queſtions in this rule, you muſt vary the order of them.

It is uſual to diſtinguiſh this rule into Direct and Inverſe proportion. Direct proportion is when more requires more, or leſs requires leſs. More requires more is, when the third term is greater than the firſt, and therefore requires the fourth term to be greater than the ſecond, in the ſame proportion. Leſs requires leſs, is when the third term is leſs than the firſt, and therefore requires the fourth term to be leſs than the ſecond, in the ſame proportion.

Inverſe proportion is when more requires leſs, or leſs requires more. More requires leſs, is when the third term is greater than the firſt, and requires the fourth term to be leſs than the ſecond. Leſs requires more, is when the third term is leſs than the firſt, and requires the fourth term to be greater than the ſecond; and then the fourth term is found by multiplying the firſt and ſecond terms together, and dividing their product by the third term: but as the foregoing elegant rule is a moſt ſure and perfect guide in ſtating every poſſible queſtion, and at the ſame time ſo plain, I have rather choſen to comprehend the whole under one general rule, than abide by the other diſtinctions.

(1) If 24 cubits of cloth coſt 18 rupees, what coſt 36 cubits?

	Proof 1ſt
24 : 18 : : 36	18 : 24 : : 27
36	27
108	168
54	48
24)648(27 rupees.	18)648(36 cubits.
48	54
168	108
168	108
. . .	. . .

Anſwer 27 rupees.

Proof 2d.	Proof 3d.
36 : 27 : : 24	27 : 36 : : 18
24	18
——	——
108	288
54	36
——	——
36)648(18 rupees.	27)648(24 cubits.
36	54
——	——
288	108
288	108
——	——
• • •	• • •

(2) A ſhip ſailed 48 leagues in 24 hours, how many miles will ſhe ſail in a week, with the ſame wind? Anſwer 1008 miles.

(3) If 18 ſeers of pepper coſt 2 ſ. rs. 8 a. what will 10 mds. 15 ſrs. 8 chs. coſt? Anſwer 15 ſ. rs. 11 a. 4 p.

(4) If 48 men can build a wall in 24 days, how many can do the ſame in 192 days? Anſwer 6 men.

(5) If I give 9 rupees for 25 ſkins, how much muſt I pay for 23 ſcore of ſkins? Anſwer 165 ſ. rs. 9 a. 7p. $\frac{5}{25}$

(6) A gentleman ſold a leaſe of ſundry houſes and grounds (which brought in 20750 ſ. rs. 12 an. in 13 years) for ten years and a half's purchaſe, what does the purchaſe money amount to? Anſwer 16760 ſ. rs. 3 an. 6p. $\frac{12}{26}$

(7) A merchant paid 496 ſ. rs. 13 a. 11 p. for a

parcel of cloth, and when he had computed the price, found that one piece, meaſuring 32 cubits, ſtood him in 39 ſ. rs 8 a. what quantity had he for his money, at that rate? Anſwer 402 cubits 9 in. $\frac{3744}{7584}$

(8) If I lend my friend 1000 rupees for 6 months, allowing the month to be 30 days, how long ought he to lend me 10,000 rupees, to requite my kindneſs? Anſwer 18 days.

(9) Bought 75 maunds of iron, at 3a. 6p. per ſeer, what is the price of the whole? Anſwer 656 ſ. rs. 4 a.

(10) Four ſea-cunnies ſailed in a ſhip, from the 21ſt of March, 1784, to the 10th of January 1785, at 12½ rupees per month, what is the amount of their wages? Anſwer, 493 ſ. rs. 5a. 4p.

(11) Suppoſe A. has an eſtate of 4500 ſ. rs. a year, and pays 7 ſ rs. 8 a. to the ſubſidy, what ſhall B. pay, whoſe eſtate is worth 9750 ſ. rs. per annum? Anſwer 16 ſ. rs. 4 a.

(12) If 1000 rupees, in 12 months, gain 12 rupees intereſt, what principal will gain the ſame in 8 months? Anſwer 1500 rupees.

(13) If the whole of a ſhip coſt 75000 rupees, what is the worth of $\frac{3}{32}$ parts? Anſwer 7031 ſ. rs. 4a.

(14) What is the price of 307 yds. 1 cub. 6 in of ſilk, at 3 ſ. rs. 4 a. per yard? Anſwer 999 rs. 14a. 8p.

(15) If 27 biggahs of land will let for 135 rupees

per month, what will 135 biggahs come to in a year at the ſame rate? Anſwer 8100 rupees per annum.

(16) If an hircarrah performs a journey in 3 days, when the days are 16 hours long, how many days will he require of 12 hours long to go the ſame journey in? Anſwer 4 days.

(17) Bought a caſk of wine for 300 rs. 12a. how many gallons were in the ſame, when the gallon was valued at 7rs. 6a. Anſwer 40 galls. 3qts. $\frac{14}{118}$

(18) Shipped for the Coaſt 1000 bags of rice, each 2mds. 5ſrs. what came they to, at 2rs. 5a. per maund? Anſwer 4914rs. 1a.

(19) Suppoſe my length, which is juſt 6 feet 6½ inches, gives 5 feet in ſhade, what ſhade will the church give, being 109 feet high? Anſwer 83f. 3½in. $\frac{77}{157}$

(20) How many yards of matting, that is half a yard wide, will cover a room that is 18 feet wide, and 30 feet long? Anſwer 120 yards.

(21) How many corge of ſtockings, at 20 annas per pair, may I buy for 178rs. 12a. 4p.? Anſwer 7 corge. 3 pairs $\frac{4}{240}$

(22) If 10 guz of ſerge coſt 22 rupees, how many cubits can I purchaſe for 18 gold mohurs? Anſwer 261 cub. 14 in. $\frac{16}{22}$

(23) If 9 maunds of ſugar coſt 80rs. 4a. 9p. how many maunds can I purchaſe for 319 rupees? Anſwer 35mds. 30ſrs. 3chs. $\frac{1269}{15417}$

(24) If 30 men do any piece of work in 12 days, how many men will do it in 18 days? Anſwer 20 men.

(25) If coffee be ſold for 35 rupees per maund, what is the price of a bale weighing 19mds. 20ſrs. 4chs.? Anſwer 682rs. 11a. 6p.

(26) At 18 rupees per week, how many days' board may I have for 350 rupees? Anſwer $136\frac{2}{18}$

(27) If 15 maunds of wax coſt 525 rupees, what coſt 2 chahtacks? Anſwer 1 anna 9 pice.

(28) If 15 rupees worth of wine will ſerve 46 men, when the pipe is worth 600 rupees, how many men will the ſame 15 rupees worth ſuffice, when the pipe is worth but 400 rupees? Anſwer 69 men.

(29) If I pay 1000 rupees for 2 mds. 5 ſrs. 8 chs. of opium, what muſt I pay for 35 maunds? Anſwer 16374 rupees 4 annas 3 pice $\frac{888}{1368}$

(30) If the creditors of a bankrupt compound with him to pay them 75 per cent. how much is he to pay when the amount of their ſeveral debts is 13543 rs. 13 a.? Anſwer 10157 rs. 13 a. 9 p.

(31) What coſt 10 bales of cotton, weighing 31 mds. 13 ſrs. 8 chs. when a bale weighing 1 md. 25 ſrs. coſt 25 rupees? Anſwer 4821 rs. 2a. 5p. $\frac{56}{104}$

(32) If when the price of a maund of flour is 6 rs. 3 a. the loaf ſhould weigh 9 chahtacks, what ſhould the loaf weigh when flour is at 4 rs. 6 as. per maund? Anſwer $12\frac{51}{79}$ chahtacks.

(33) If a ſilver ſalver weighs 35 rs. 13 a. what is its worth at 17½ annas per ſicca weight? Anſwer 39 rs. 2 a. 8 p. $\frac{10}{16}$

(34) What coſt 4939 caſe-knives, at 5 rupees per dozen? Anſwer 2057 rs. 14 a. 8 p.

(35) A goldſmith ſold a tankard for 109 rupees, at 18 a. 4 p. per ſicca weight, I demand the weight of it? Anſwer 95 rs. 2 a. $\frac{8}{220}$

(36) Suppoſe 800 ſoldiers were placed in a garriſon, and their proviſions were computed ſufficient for 2 months, how many ſoldiers muſt depart, that the proviſions may ſerve them 5 months? Anſwer 480 men muſt depart.

(37) If I pay 164 rupees for 3 mds. 4 ſrs. of turmerick, what quantity can I purchaſe for 462 rs. 8 a. 6 p.? Anſwer 8 mds. 29 ſrs. 11 chs. $\frac{15744}{31488}$

(38) If a family of 9 perſons, eat 7 mds. 20 ſrs. of rice in a month, how much will ſerve them, when they are 16 in a family? Anſwer 13 mds. 13 ſrs. 5 $\frac{3}{9}$ chs.

(39) A merchant bought a piece of cloth for 137 rupees 10 annas 4 pice, at 13 rs. 4 a. per yard, how many yards did it contain? Anſwer 10 yds. 1 ft. 1 in. $\frac{2496}{2544}$

(40) There was a certain building raiſed in 8 months by 120 workmen; but the ſame being demoliſhed, it is required to be built in 2 months, I demand how many men muſt be employed about it? Anſwer 480 workmen.

(41) If 462 rs. 8 a. 6 p. will purchaſe 8 mds. 29 ſrs.

11 chs. of turmerick, how much will 164 rupees purchaſe? Anſwer 3mds. 3ſrs. 15chs. $\frac{73062}{88806}$

(42) If 18 horſes eat up 51 maunds of gram in a week's time, how many maunds will ſerve 20 horſes the ſame time? Anſwer 56 mds. 26 ſrs. 10 chs. $\frac{12}{18}$

(43) If I pay for a pipe of Madeira 524 rs. 8 a. 6 p. what is that per quart? Anſwer 1 r. 0 a. 7p. $\frac{414}{504}$

(44) A piece of tapeſtry is 3 ells Flemiſh wide, and 4 ells Flemiſh long; and it is required to be lined with ſomething that is but 3 quarters of a yard wide; I demand how many yards there muſt be to complete the lining? Anſwer 9 yards.

(45) If a hogſhead of ſweet oil coſt 300 rupees, what coſt a caſk meaſuring 13 gallons 3 pints? Anſwer 63 rs. 11 a. 0 p. $\frac{288}{504}$

(46) If 3 maunds 4 ſeers of turmerick coſt 164 rupees, what will 8 mds. 29 ſrs. 11 chs. coſt? Anſwer 462 rs. 7 a. 10 p. $\frac{128}{1984}$

(47) If 1 ſeer of tobacco coſt 1 r. 14 a. 6 p. what coſt 3 hogſheads, each weighing 40 mds. 20 ſrs. 8 chs.? Anſwer 9267 rs. 3 a. 9 p.

(48) How many yards of canvas, that is ell wide, will be ſufficient to line 20 yards of ſay, that is 3 quarters wide? Anſwer 12 yards.

(49) If 1 oz. of ſilver coſt 2rs. 2a. what is the price of a tankard that weighs 1 lb. 10 oz. 10dwts. 4 grs? Anſwer 47rs. 13a. 3p. $\frac{192}{480}$

(50) If 8mds. 29ſrs. 11chs. of turmerick coſt 462rs. 8a. 6p. what will 3mds. 4ſrs. coſt? Anſwer 164rs. 0a. 2p. $\frac{4554}{5595}$

(51) If 1 maund of ſugar coſt 19 rupees, what coſt 24 bags, each weighing 23 mds. 15 ſrs. 8chs? Anſwer 10664rs. 11a. 2p. $\frac{256}{640}$

(52) How many yards of green caſſimere are ſufficient to make a coat of equal extent with one, which hath in it 4 yards of 7 quarters wide, when the caſſimere is but 3 quarters wide? Anſwer $9\frac{1}{3}$ yards.

(53) If 1 ſeer 8 chahtacks of ſugar coſt 14 annas, what coſt 1md. 18ſrs.? Anſwer 541rs. 5a. 4p.

(54) If 502 pairs of ſhoes, according to invoice, coſt 1400rs. 8a. 6p. what is the price of 1 dozen pairs? Anſwer 33rs. 7a. 7p. $\frac{470}{502}$

(55) If a hamper of porter, containing 3 dozens, coſt 28 rupees, what coſt 113 dozens and 7 bottles? Anſwer 1060rs. 1a. 9p. $\frac{12}{36}$

(56) If a taylor can make a coat and waiſtcoat with 3 yards and three quarters of broad cloth of one yard and a half's breadth, how many yards of ſtuff of a yard and a quarter wide will he require to fit the ſame perſon? Anſwer $4\frac{1}{2}$ yards.

(57) If 3mds. 4ſrs. of turmerick coſt 164 rupees, what will 1 ſeer coſt? Anſwer 1r. 5a. 1p. $\frac{116}{124}$

(58) If 164 rupees will pay for 3mds. 4ſrs of turmerick, how much will 1r. 5a. 1p. pay for? Anſwer 15 chahtacks $\frac{29632}{31488}$

(59) If 1r. 5a. 1p. will pay for 1 ſeer of turmerick, how much will 164 rupees pay for? Anſwer 3mds. 4ſrs. 7chs. $\frac{85}{253}$.

(60) If 12 men make 130 cubits of ditching in 4 days, in what time will 24 men perform the ſame at the ſame rate of working? Anſwer 2 days.

(61) If 8mds. 29ſrs. 11chs. of turmerick coſt 462rs. 8 a. 6 p. what will 1 maund coſt? Anſwer 52 rs. 14 a. 6 p. $\frac{18305}{5595}$

(62) If 1 maund of turmerick coſt 52rs. 14 a. 6 p. what will 8mds. 29ſrs. 11chs. coſt? Anſwer 462rs. 8 a. 3 p. $\frac{9}{64}$.

(63) How much turmerick can I purchaſe for 462rs. 8 a. 6 p. if 1 maund coſt 52 rs. 14 a. 5 p? Anſwer 8mds. 29ſrs. 11chs. $\frac{7425}{10157}$

(64) A body, weighing 20 ſeers, is impelled by ſuch a force, as to ſend it 100 cubits in a ſecond, with what velocity would a body of 8 ſeers weight move, if it were impelled by the ſame force? Anſwer 250 cubits in a ſecond.

(65) How much turmerick can I purchaſe for 52rs. 14 a. 5 p. if 8mds. 29ſrs. 11chs. coſt 462 rs. 8 a. 6 p.? Anſwer 39ſrs. 15chs. $\frac{81381}{88806}$

(66) Bought a caſk of turmerick for 170 rs. 10 a. which weighed 5mds. 20ſrs. 8chs. I demand the price of 4 caſks, containing 6mds. 20ſrs. 8chs. each? Anſwer 806 rs. 4 a. 11 p. $\frac{15112}{35528}$

(67) Bought a quarter caſk of Madeira for 150 ſicca rupees, at 2rs. 11a. per gallon, how many gallons did it contain? Anſwer 55 gal. 3 qts. $\frac{11}{43}$.

(68) The battering-ram of Veſpaſian weighed, ſuppoſe 100000lb. and was moved, let us admit,

with ſuch a velocity by ſtrength of hands, as to paſs through 20 feet in one ſecond of time, and this was found ſufficient to demoliſh the walls of Jeruſalem; with what velocity muſt a bullet, that weighs but 30℔. be moved, in order to do the ſame execution? Anſwer 66666 $\frac{2}{3}$ feet.

(69) If 27 hogſheads of brandy coſt 3800rs. what is that per gallon? Anſwer 21s. 3a. 8p. $\frac{1572}{1701}$

(70) A draper bought of a merchant 8 packs of cloths, each pack had 4 parcels in it, each parcel contained 10 pieces, and each piece 52 cubits; he gave after the rate of 14rs. 8a. for 14 cubits, what came the 8 packs to, and what was it worth per yard? Anſwer 17234rs. 4a. 6p. $\frac{12}{14}$ whole coſt, and 2rs. 1a. 1p. $\frac{10}{14}$ per yard.

THE DOUBLE RULE OF THREE.

SO called, from having five terms given in a queſtion to find a ſixth, which bears the ſame proportion to the fourth and fifth, as the third does to the firſt and ſecond, which may be wrought by two Single Rules of Three, thus: firſt, ſet down the quantity that is of the ſame kind with the quantity ſought; then take one of the two numbers of which the queſtion is raiſed, and its correſponding number of the ſame name, and place them according to the rule laid down in the Single Rule of Three. Secondly, Three of the five given numbers being thus ſtated, find a fourth proportional. Thirdly, put the fourth number reſulting from the work of the firſt ſtating for the ſecond number of the ſecond ſtating; then the remaining number of which the queſtion is raiſed, and its correſponding number of the ſame name being placed as before directed, the fourth number reſulting from them will be the anſwer.

Prove queſtions in this rule by the Rule of Five, thus:

I. Let the five numbers ſtand in one continued rank. II. Place the firſt term of the firſt Single Rule of Three ſtating for the firſt term in the rank. III. Place the firſt term of the ſecond ſtating for the ſecond term in the rank. IV. Place the number which is of the ſame name with the quantity ſought in the middle; and V. The third terms of the two ſtatings for the fourth and fifth terms in the rank. Let the fourth term correſpond with the firſt, and the fifth with the ſecond. Then multiply the firſt and ſecond numbers together for a diviſor, and the other three for a dividend; the quotient will be the anſwer, of the ſame name with the middle number.

(1) If 9 men in 21 days mow 108 cottahs of ground, in how many days will five men mow 72 cottahs at the ſame rate of working?

Cot. Days. Cot.
108 : 21 :: 72
21
108)1512(14 days.
108
432
432
...

Men. Days. Men.
5 : 14 :: 9
9
5)126
Days $25\frac{1}{5}$ Anſwer.

Proof, according to the foregoing rule.

Cot. Men. Days. Cot. Men.
108 × 5 : 21 :: 72 × 9
5 9
540 648
21
540)13608(25 days.
108
280
270
108

$\frac{108}{540} = \frac{1}{5}$

(2) If a regiment of ſoldiers conſiſting of 939 men can eat up 351 maunds of rice in 7 months, how many ſoldiers will eat up 1464 maunds in 5 months at that rate? Anſwer 548 $\frac{207}{1755}$ ſoldiers.

(3) If an hircarrah travels 320 coſs in 10 days, when the days are 12 hours long, how many days

may he travel 640 coſs, when the days are 16 hours long? Anſwer 15 days.

(4) If 360 rupees ſerve for the board of 12 perſons 6 weeks, how long, or how many weeks, will 2600 rupees ſerve for the board of 35 perſons? Anſwer $14\frac{12}{36}$ weeks.

(5) If 36 ſeers of paddy in one year yield 216 maunds, how much will 36 maunds yield in 6 years? Anſwer 51840 maunds.

(6) If 50 pioneers in 6 days caſt a trench 30 yards long, how many pioneers will caſt a trench 200 yards long, in 3 days? Anſwer $666\frac{2}{3}$ pioneers.

(7) If a manjee receives 30 rupees for the carriage of 30 maunds weight 150 coſs, what muſt he receive for the carriage of 70 maunds weight 50 coſs? Anſwer 23rs 5a. 4p.

(8) If 6 maunds of rice are ſufficient for a family of 12 perſons for 3 months, how many maunds will ſerve a family of 24 perſons for 12 months? Anſwer 48 maunds.

(9) If 15 rupees will pay 5 men for 6 days' labour, how much will pay 20 men for 10 days' labour? Anſwer 100 rupees.

(10) If 36 cottahs of graſs be mowed by 6 men in 8 days, how many cottahs may be mowed by 36 men in 38 days? Anſwer 1026 cottahs.

(11) If 1000 lb. of beef or pork ſerve 250 ſeamen 7 days, how many pounds of beef will ſerve 550 ſeamen 9 weeks? Anſwer 19800 lb.

(12) If 8000 maunds of ammunition were to be removed from a place in 9 days, and that in 6 days time I find 4500 maunds were carried away by 18 bullocks, how many bullocks would be wanted to carry away the remainder in 3 days? Anſwer 28 bullocks.

(13) If 200 ſeers are carried 40 coſs for 2rs. 4a. how much muſt be paid for carrying 20200 ſeers 60 coſs? Anſwer 340rs. 14a.

(14) If 3 ſeers of cotton make 10 yards of ſtuff of 1 yard 2 quarters broad, how many ſeers would be wanted to make a piece 100 yards long and 3 quarters broad? Anſwer 15 ſeers.

(15) If 200 ſeers of merchandize are carried 40 coſs for 2rs. 4a. how many ſeers may be carried 60 coſs for 340rs. 14a.? Anſwer 20200 ſeers.

(16) If for 2rs. 4a. 200 ſeers of goods are carried 40 coſs, how many coſs might 20200 ſeers be carried for 340rs. 14a.? Anſwer 60 coſs.

(17) If a ſeer of thread make 3 yards of linen 5 quarters broad, how many ſeers of thread would be wanted to make one piece of linen 45 yards long and 1 broad? Anſwer 12 ſeers.

(18) If there muſt be 5400 bricks 6 inches long and 3 broad to pave a hall, how many bricks will it require to pave the ſame hall, that are 9 inches long and 4 broad? Anſwer 2700 bricks.

(19) If an army, conſiſting of 7500 ſoldiers, eat up 2865 bags of rice in 56 days, how many bags will

an army, conſiſting of 130000 ſoldiers eat in 142 days? Anſwer 125923 bags $\frac{32}{56}$

(20) If the carriage of 5 maunds 30 ſeers weight for 150 coſs coſt 3rs. 7a. 4p. what muſt be paid for the carriage of 7 maunds 20 ſeers weight for 64 coſs, at the ſame rate? Anſwer 1r. 14a. 9p. $\frac{74}{150}$

(21) If a piece of ground 42 cubits long and 3 broad coſt 63 rupees, how much will a piece of land contiguous to it be valued at, that is 36 cubits long and 4 broad? Anſwer 72 rupees.

(22) If 8 men in 6 days dig 24 cubick cubits of earth, how many cubits at the ſame rate will 12 men dig in 3 days? Anſwer 18 cubick cubits.

(23) If 56 loaves of bread will be ſufficient for 7 men 14 days, how much bread will ſerve 21 men 3 days? Anſwer 36 loaves.

(24) If 8 reapers have 10 rs. 8 a. for 4 day's work, how much will 48 reapers have for 16 day's work? Anſwer 252 rupees.

(25) If 50 maunds of gram be enough for 20 horſes 20 days, how many maunds will ſerve 60 horſes 36 days? Anſwer 270 maunds.

(26) If 100 rupees in 12 months gain 12 rupees intereſt, what intereſt will 2000 rupees gain in 18 months? Anſwer 360 rupees.

(27) A certificate of the Honourable Company for 2217 rs. 14 a. 9 p. dated 10th of April, 1787, will be paid this day being the 21ſt of Auguſt 1788, what will be the amount when the ſaid bond bears intereſt at 8 per cent.? Anſwer 242 rs. 1 a. 4 p. $\frac{166}{365}$

(23) One perſon lent another 1875 rupees, for which he was to receive a certain premium by the year for every 100 rupees, and when 8 months were expired, he received his own money and 150 rupees more; I demand, how much he received for every 100 rupees? Anſwer 11 rs. 9 a. 7 p. $\frac{375}{1857}$

PRACTICE

IS a ſhort way of finding the value of any quantity of goods by the given price of one integer.

TABLES.

Aliquot parts of an anna and rupee.

p.			
6	is the	$\frac{1}{2}$	of an anna.
4		$\frac{1}{3}$	
3		$\frac{1}{4}$	
2		$\frac{1}{6}$	
1		$\frac{1}{12}$	

a.	p.			
8	0	is the	$\frac{1}{2}$	of a rupee.
5	4		$\frac{1}{3}$	
4	0		$\frac{1}{4}$	
2	8		$\frac{1}{6}$	
2	0		$\frac{1}{8}$	
1	4		$\frac{1}{12}$	
1	0		$\frac{1}{16}$	

Aliquot parts of a ſeer and maund.

chs.			
8	is the	$\frac{1}{2}$	of a ſeer.
4		$\frac{1}{4}$	
2		$\frac{1}{8}$	
1		$\frac{1}{16}$	

ſrs.	chs.			
20	0	is the	$\frac{1}{2}$	of a md.
10	0		$\frac{1}{4}$	
8	0		$\frac{1}{5}$	
5	0		$\frac{1}{8}$	
4	0		$\frac{1}{10}$	
2	8		$\frac{1}{16}$	
2	0		$\frac{1}{20}$	
1	4		$\frac{1}{32}$	
1	0		$\frac{1}{40}$	

CASE I.

When the price of an integer is leſs than an anna, find the aliquot parts of that price contained in the anna, which muſt be the diviſor to the given ſum, and ſet them thus, $\begin{matrix}6-\frac{1}{2}\\3-\frac{1}{4}\end{matrix}$ &c. the firſt column being the money, and the other the parts.

Note, When there are more aliquot parts than one, their quotients muſt be added together, and the ſum, if the firſt aliquot parts be taken from an anna, will be annas, or if taken from a rupee, it will be rupees. It will alſo be better to take parts of parts than parts of the whole price, and then the above may ſtand thus, $\begin{matrix}6-\frac{1}{2}\\3-\frac{1}{2}\end{matrix}$

(1) What is the value of 931 chahtacks, at 1 pice per chahtack?

Chs. 931 at 1 pice each.

p. ——

1—$\frac{1}{12}$—77 7

16 ———

rs. 4 13 7 anſwer.

Proof.

931chs. at 1p. each = 931p. which being divided by 12 and 16 produces 4rs. 13a. 7p. the anſwer.

	chs.		p.			rs.	a.	p.
(2)	796	at	2	each	=	8	4	8
(3)	987	at	3	each	=	15	6	9
(4)	735	at	4	each	=	15	5	0
(5)	936	at	5	each	=	24	6	0
(6)	7416	at	6	each	=	231	12	0
(7)	8900	at	7	each	=	324	7	8
(8)	7906	at	8	each	=	329	6	8
(9)	1401	at	9	each	=	65	10	9
(10)	1911	at	10	each	=	99	8	6
(11)	7246	at	11	each	=	415	2	2

CASE II.

When the price of an integer is leſs than a rupee, then find the aliquot parts of that price contained in the rupee, which muſt be the diviſors to the given ſum. Or thus; if the given price be not the aliquot part of a rupee, then firſt take ſome part of it, that is an aliquot part, and for the remaining part of the price, let it be taken out of the foregoing part or parts, and then add the quotients together as before, the total will be the anſwer, in rupees. Or multiply the given integers by the annas, and take parts with the price, which added together gives the anſwer in annas.

(1) What is the value of 9276 ſeers, at 1 anna per ſeer?

ſeers. anna.
9276 at 1 each.

1a.—$\frac{1}{16}$—Rs.579 12 anſwer.

Proof.

9276 ſrs. at 1 a. each = 9276 a. which being divided by 16, produces 579rs. 12a. the anſwer.

Again,

Seers.
(2) 9718 at 1a. 4p. each.

1a. 4p.—$\frac{1}{12}$—Rs.809 13 4 anſwer.

Proof.

9718 multiplied by the annas is equal to 9718 a. then take parts with the price thus, 4p.—⅓—3239 4

which are annas 12957 4
16——
Rs. 809 13 4 anſwer.

Another proof.

9718
1a. 4p. = 16p.

155488p.
12——
a. 12957 4
16——
Rs. 809 13 4 anſwer.

	ſeers.		a.	p.		rs.	a.	p.
(3)	8704	at	2		each, =	1088	0	0
(4)	7912	at	2	8	each, =	1318	10	8
(5)	7804	at	3		each, =	1463	4	0
(6)	9306	at	3	7	each, =	2084	2	6
(7)	9264	at	4		each, =	2316	0	0
(8)	6000	at	4	10	each, =	1812	8	0
(9)	8091	at	5		each, =	2528	7	0
(10)	7269	at	5	4	each, =	2423	0	0
(11)	7241	at	6		each, =	2715	6	0
(12)	7269	at	6	5	each, =	2915	2	9
(13)	9204	at	7		each, =	4026	12	0
(14)	6924	at	7	9	each, =	3353	13	0

	ſeers.		a.	p.		rs.	a.	p.
(15)	7046	at	8		each, =	3523	0	0
(16)	9241	at	8	1	each, =	4668	10	1
(17)	9241	at	9		each, =	5198	1	0
(18)	5951	at	9	6	each, =	3533	6	6
(19)	6302	at	10		each, =	3938	12	0
(20)	9603	at	10	9	each, =	6452	0	3
(21)	7912	at	11		each, =	5439	8	0
(22)	7946	at	11	1	each, =	5504	4	2
(23)	6041	at	12		each, =	4530	12	0
(24)	7261	at	12	3	each, =	5559	3	3
(25)	7024	at	13		each, =	5707	0	0
(26)	9248	at	13	6	each, =	7803	0	0
(27)	9391	at	14		each, =	8217	2	0
(28)	7291	at	14	9	each, =	6721	6	3
(29)	7912	at	15		each, =	7417	8	0
(30)	9186	at	15	9	each, =	9042	7	6

CASE III.

When the price of an integer is greater than a rupee, but leſs than two rupees, then let the part or parts be taken only with ſo much of the given price, as is more than one rupee, that is, if the price be 1 r. 6 a. 2 p. take the parts only with 6 a. 2 p. and let the given quantity ſtand for rupees, which muſt be added with the reſt, and the total will be the anſwer in rupees. Or reduce the given ſum to annas, and multiply the quantity by the annas, and take parts with the reſt, then add them together, the ſum will be the anſwer in annas.

(1)

(1) What is the value of 7694 maunds, at 1 rupee 1 anna per maund.

mds.
7694 at 1 r. 1 a. each,
1 a.—$\frac{1}{16}$—480 14
Rupees 8174 14 Anſwer.

mds.
Proof. 7694 at 1 r. 1 a. each.
17 16
a. 130798 17 a.
16
Rupees 8174 14

(2) What is the value of 7243 maunds at 1 r. 1 a. 2 p. per maund?

mds.
7243 at 1 r. 1 a. 2 p. each.
1 a.—$\frac{1}{16}$—452 11
2 p.—$\frac{1}{6}$— 75 7 2
Rupees 7771 2 2 Anſwer.

mds.
Proof. 7243 at 1 r. 1 a. 2 p. per maund.
17
123131
2 p.—$\frac{1}{6}$— 1207 2
124338 2
16
Rupees 7771 2 2

	mds.		rs.	a.	p.		rs.	a.	p.
(3)	6384	at	1	2	3	each,=	7281	12	0
(4)	7916	at	1	3	0	each,=	9400	4	0
(5)	3333	at	1	3	6	each,=	4062	1	6
(6)	9116	at	1	4	7	each,=	11727	5	8
(7)	7602	at	1	5	0	each,=	9977	10	0
(8)	9172	at	1	5	10	each,=	12515	15	4
(9)	6837	at	1	6	11	each,=	9792	9	3
(10)	9418	at	1	7	2	each,=	13636	7	8
(11)	6914	at	1	7	4	each,=	10082	14	8
(12)	1111	at	1	8	5	each,=	1695	6	11
(13)	9416	at	1	9	0	each,=	14712	8	0
(14)	9426	at	1	9	8	each,=	15120	14	0
(15)	7312	at	1	10	9	each,=	12224	12	0
(16)	6019	at	1	11	0	each,=	10157	1	0
(17)	9071	at	1	11	1	each,=	15354	8	11
(18)	9412	at	1	12	0	each,=	16471	0	0
(19)	3591	at	1	12	4	each,=	6359	1	0
(20)	6290	at	1	13	5	each,=	11564	6	10
(21)	9706	at	1	14	0	each,=	18193	12	0
(22)	7974	at	1	14	8	each.=	15283	8	0
(23)	240	at	1	15	2	each,=	467	8	0
(24)	609	at	1	15	6	each,=	1198	15	6

CASE IV.

When the price of an integer is rupees only, multiply the given integers by the price, the product will be the anſwer.

(1) What is the value of 85 caſes of gin, at 1 gold mohur per caſe?

85
1 g.m. = 16 rs.

Rs. 1360 anſwer.

			rs.		rs.
(2)	946 pairs of ſhades,	at	18	per pair,	=17028
(3(	459 pieces of ſilk, -	at	31	per piece,	=14229
(4)	942 corge of ſtockings,	at	24	per corge,	=22608
(5)	724 dozens of Claret,	at	25	per dozen,	=18100
(6)	20000 Quills, - -	at	3	per hund.	= 600

CASE V.

When the price of an integer is rupees annas and pice, multiply the given integers by the rupees, and divide by the parts, which added together gives the anſwer.

(1) What is the value of 3 pieces of cloth, each 15 yards, at 7rs. 8a. per yard?

15
3

45 yds. at 7rs. 8a.
7

315 rs.
8a.—$\frac{1}{2}$—22 8

Rs. 337 8 anſwer.

Proof.

45yds. at 7rs. 8a. each.
120 16
54002. 120a.
16——
Rs. 337 8

(2) What is the value of 75 cubits of muſlin at 2rs. 8a. 6p. per cubit?

75 cub.
2
150
8a.—$\frac{1}{2}$—37 8
6p.—$\frac{1}{16}$—2 5 6
Rs. 189 13 6 anſwer.

Proof.

75 cub. at 2rs. 8a. 6p.
40 16
3000 40 a.
6p.—$\frac{1}{2}$—37 6
a. 3037 6
16——
Rs. 189 13 6

	yds.		rs.	a.	p.			rs.	a.	p.
(3)	731	at	6	8	0	each,	=	4751	8	0
(4)	924	at	9	12	0	each,	=	9009	0	0
(5)	812	at	8	1	0	each,	=	6546	12	0
(6)	6418	at	2	5	0	each,	=	14841	10	0
(7)	693	at	6	15	0	each,	=	4807	11	0

	yards,		rs.	a.	p.			rs.	a.	p.
(8)	641	at	31	5	4	each,	=	20084	10	8
(9)	200	at	7	1	4	each,	=	1416	10	8
(10)	594	at	20	5	4	each,	=	12078	0	0
(11)	739	at	6	3	9	each,	=	4607	3	3
(12)	729	at	7	3	11	each,	=	5281	7	3
(13)	900	at	9	15	11	each,	=	899	5	0
(14)	719	at	5	7	9	each,	=	3943	14	3

CASE VI.

When the number of integers does not exceed 12, multiply the price by the integers, as in compound Multiplication; the quotient will be the anſwer.

(1) What is the value of 10 maunds of wood, at 10 rs. 10 a. 8 p. per maund.

10rs. 10 a. 8 p.
10

Rs. 106 10 8 anſwer.

Proof 10 mds.
10

100
8 a. — ½ — 5
2 a. 8p.—⅓— 1 10 8

rs. 106 10 8

(2) What is the value of 16 maunds of candles, at 65rs. 12a. per maund?

65rs. 12 a.
16

Rs. 1052 0 anſwer.

Proof 65
16

1040
8 a.—½——8
4 a.—½——4

rs. 1052

			rs.	a.	p.		rs.	a.	p.
(3)	11 maunds	at	17	14	6	each, =	196	15	6
(4)	8 maunds	at	64	10	8	each, =	517	5	4
(5)	9 yards	at	9	15	9	each, =	89	13	9
(6)	12 yards	at	84	13	7	each, =	1018	3	0

CASE VII.

When the goods, and the prices are of different denominations, multiply the integers of each denomination together, and take parts with the parts of the integers from one another, thus:

(1) What is the value of 99mds. 1ſr. 4chs. of ſugar at 8rs. 8a. per maund ?

mds. ſrs. chs. — rs. a.
99 1 4 — 8 8
8
1ſr. 4ch.—$\frac{1}{32}$—0 4 3
792
8a.—$\frac{1}{2}$— 49 8
4 3
Rs. 841 12 3 anſwer.

Proof.

99mds. 1 ſr. 4 chs. at 8 rs. 8a.
136 — 16
594 — 136 a.
1287
1ſr.4chs.—$\frac{1}{32}$ — 4 3
a. 13468 3
16
Rs. 841 12 3

(2)

(2) 6mds. 2ſrs 8chs. of fine ſalt at 5rs. 4a. per maund, = 31rs. 13a. 3p.

(3) 12mds. 8ſrs. 4 chs. of wax candles at 72rs. 8a. per maund, = 884rs. 15a. 3p.

(4) 5ſrs. 2chs. of tootanague at 25rs. 8a. 4p. per maund, = 3rs. 4a. 3p.

(5) 20ſrs. 8chs. of iron at 8rs. 5p. per maund, = 4rs. 1a. 10p.

(6) 1md. 19ſrs. 8chs. of ſugar at 6rs. 8a. per maund, = 9rs. 10a. 7p.

(7) 1md. 27ſrs. 4chs. of raiſins at 49rs. 8a. per maund. = 83rs. 3a. 6p.

(8) 36 ſeers of almonds at 85rs. 9a. per maund, = 77rs.

(9) 31 ſeers of jaggery at 6rs. 8a. per md. = 5rs. 7p.

(10) 17ſrs. 8chs. of fine coffee at 220rs. per maund, = 96rs. 4a.

(11) 3 ſeers of tea at 120rs. per maund, = 9rs.

(12) 9mds. 10ſrs. 4chs. of ghee at 11rs. 12a. 6p. per ſeer, = 4362rs. 1p.

(13) 8mds. 12ſrs. 7chs. of opium at 7rs. 14a. per ſeer, = 2617rs. 15a. 1p.

(14) 8yds. 18in. of broad cloth at 15rs. 13a. 4p. per yard, = 134rs. 9a. 4p.

(15) 12½ pieces of muſlin at 20rs. 5a. 4p. per piece, = 254rs. 2a. 8p.

SIMPLE INTEREST

IS a premium paid by the borrower of money to the lender, and is the profit which ariſes from the loan of it. In reſolving queſtions in Intereſt regard as follows:

1ſt, The principal, or money lent. P.
2ndly, The rate per cent, or premium. R.
3dly, The time for which the principal is lent. T.
4thly, The amount, or ſum of the principal and Intereſt. A.

CASE I.

When the intereſt of any ſum of money for one year or more is required.

RULE I.

As 100
Is to the rate per cent;
So is the principal
To its intereſt for one year, which being multiplied by the number of years, (if more than one is required) gives the intereſt for that time.

RULE II.

By Practice. Take parts with the rate per cent. out of 100, and divide the principal by thoſe parts; the quotient, or ſum of the quotients, if more than one, will produce the intereſt for one year.

RULE III.

As 100
Is to 100 added to the rate per cent;

So is the principal

To the amount, from which ſubſtract the principal, and the remainder will be the intereſt for one year.

RULE IV.

Divide the principal by 100, and multiply the quotient by the rate per cent, then the product will be the intereſt for one year.

RULE V.

Multiply the time by the rate per cent, and take parts with the product out of 100, divide the principal by thoſe parts, and the ſum of the quotients gives the intereſt for the time required: which being divided by the time given, will alſo produce the intereſt for one year.

If 100 rupees principal in one year's time yield 12 rupees intereſt, what will 486 rs. yield in the ſame time?

1ſt Way. 100 : 12 : : 486
12

rs. 58,32
16

a. 5,12
12

Anſwer, 58rs. 5a. 1p. $\frac{44}{100}$ p. 1,44

2d Way. 486 rs.

10rs.—$\frac{1}{10}$—48 9 7
2rs.—$\frac{1}{5}$—9 11 6

rupees 58 5 1 anſwer,

3d Way. 100 112 486
112

5832
486

rs. a. p.
544 5 1 Amount, rs. 544,32
486 Principal, 16

Anſwer, 58 5 1 Interſt. a. 5,12
12

p. 1,44

4th Way. rs. 486
16

4rs. 13a. 9,12p. a. 13,76
12 12

Rs. 58 5 1,44 anſwer. p. 9,12

5th Way, if the intereſt was required for 2 years.

486

20rs.—$\frac{1}{5}$—97 3 2
12 R. 4rs.—$\frac{1}{5}$—19 7 0
2 T.

rs. 118 10 2 Intereſt for 2 yrs.
24 Product. 2

rs. 59 5 1 Intereſt for 1 yr.

(2) What is the intereſt of 76 rupees for 2 years at 9 per cent per annum? Anſwer 13rs. 10a. 10p.

(3) What is the intereſt of 220 rupees for a year at 10 per cent per annum? Anſwer 22 rupees.

(4) What is the amount of 3000 rupees for 12 years at 9 per cent per annum? Anſwer 6240 rupees amount.

(5) What is the amount of 5000 rupees for 12 years at 12 per cent per annum? Anſwer 12200 rupees amount.

CASE II.

To find the intereſt of any ſum for $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$ of a year beſides the number of years given in the queſtion.

RULE.

For $\frac{1}{4}$ year take a quarter part of the intereſt of 1 year; for $\frac{1}{2}$ a year take half of the intereſt of one year; for $\frac{3}{4}$ of a year take the parts compounded of $\frac{3}{4}$, and add them to the intereſt for the reſt of the time; the ſum will be the intereſt required.

(1) What is the intereſt of 200 rupees for 3 years and $\frac{3}{4}$ at 9 per cent per annum?

1ſt way. 100 : 9 : : 200

9

Intereſt for 1 year 18,00

3

54 Intereſt for 3 years.

$\frac{1}{2}$—$\frac{1}{2}$—9 Intereſt for $\frac{1}{2}$ year.

$\frac{1}{4}$—$\frac{1}{2}$—4 8 Intereſt for $\frac{1}{4}$ year.

Anſwer Rs. 67 8 Intereſt for $3\frac{3}{4}$ years.

2d way. 200rs.

5rs.—$\frac{1}{20}$—10
4rs.—$\frac{1}{25}$— 8

Rs. 18 one year's intereſt; then proceed as before.

3d way. 9rs. being the intereſt of 100rs. for 1 year,
ſo 3 yrs.

27 the intereſt of 100rs. for 3 years.
$\frac{1}{2}$—$\frac{1}{2}$— 4 8 intereſt for $\frac{1}{2}$ year.
$\frac{1}{4}$—$\frac{1}{4}$— 2 4 intereſt for $\frac{1}{4}$ year.

Rs. 33 12 intereſt of 100 for $3\frac{3}{4}$ years.

33 12
100

then 100 : 133 12 :: 200
16

2140 a.
200

4280,00
16

267 8 amount.
200 principal.

Anſwer 67 8 intereſt.

4th way. 2,00
9

18 intereſt for 1 year.

5th way. $3\frac{3}{4}$ years.
9 R.
———
$33\frac{3}{4}$ Prod.

200
———
25 — $\frac{1}{4}$ — 50
$6\frac{1}{4}$ — $\frac{1}{4}$ — $12 \quad 8$
$2\frac{1}{2}$ — $\frac{1}{10}$ — 5
———
Rs. 67 8 anſwer.

(2) What is the intereſt of 468rs. 12a. 4p. for 1 year and $\frac{3}{4}$ at 8 per cent per annum? Anſwer 65rs. 10a.

(3) What is the intereſt of 1112rs. 10a. 4p. for 5 and $\frac{1}{2}$ years at 8 per cent per annum? Anſwer 489rs. 8a. 11p.

(4) What is the intereſt of 1468rs. for 4 and $\frac{1}{4}$ years at 12 per cent per annum? Anſwer 748rs. 10a. 7p.

(5) What is the intereſt of 1000rs. for 2 and $\frac{3}{4}$ years at 12 per cent per annum? Anſwer 330rs.

CASE III.

To find the intereſt of any ſum for any number of months leſs than 12.

RULE I.

Take parts with the number of months given out of 12, and divide the intereſt of one year by thoſe parts for the intereſt of the months required.

RULE II.

Divide the intereſt of the principal for 1 year by 12, and multiply the quotient by the months given for the intereſt of the months required.

(1) What is the intereſt of 1000 rupees for 5 months, at 8 per cent. per annum?

1ſt way. 100 : 8 :: 1000
8
Intereſt for 1 year 80,00
4m.—$\frac{1}{3}$—26 10 8
1m.—$\frac{1}{4}$— 6 10 8
Anſwer Rs. 33 5 4 five months' intereſt.

2d way. 80 —— intereſt for 12 months.
12 ——
6 10 8 intereſt for 1 month.
5
Anſwer Rs. 33 5 4 intereſt for 5 months.

3d way. 8rs
12 ——
· 10 8 intereſt of 100rs. for 1 month.
5
3 5 4 intereſt of 100rs. for 5 months.
100
Rs. 103 5 4 amount of 100rs. for 5 months.

100 : 103 5 4 :: 1000
16
1653 a.
12
198400,00
12 ——
16533 4
16 ——
1033 5 4 amount.
1000 principal.
Anſwer Rs. 33 5 4 intereſt.

4th way. 8 R. 1000
5 T.
40 Prod.
20rs.-$\frac{1}{5}$—200
20rs.-$\frac{1}{5}$—200
400
12
Anſwer Rs. 33 5 4 intereſt.

(2) What is the intereſt of 5000rs. 8a. for 6$\frac{1}{2}$ months at 10 per cent per annnm? Anſwer 270rs. 13a. 8p.

(3) What is the amount of 3260rs. 5a. 4p. for 10 months at 6 per cent per annum? Anſwer 3423rs. 5a. 6p.

(4) What is the intereſt of 4500rs. for 1 year 4 ms. at 12 per cent per annum? Anſwer 720rs.

(5) I demand the amount of 3276rs. 12a. for 2 years 2 months at 8 per cent per annum? Anſwer 3844rs 11a. 4p.

CASE IV.

To find the intereſt of any ſum when the rate per cent is $\frac{1}{4}$, $\frac{1}{2}$, or $\frac{3}{4}$ more than the rupees given in the ſaid rate.

RULE.

Multiply the principal by the rupees in the rate per cent as before, and let the parts for $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ be taken from the principal and added to that product, then proceed as in Caſe the 1ſt and 2d.

(1) What is the intereſt of 400 rupees for 2 years at 9½ per cent per annum?

1ſt way. 100 : 9½ :: 400
9½
3600
½— 200
Intereſt for 1 year 38,00
2
Intereſt for 2 years 76 anſwer.

2d way. 400rs.
10rs.— $\frac{1}{10}$ — 40
½ — $\frac{1}{20}$ — 2 which ſubſtract from 40 gives
38 the intereſt for 1 year at 9½ per cent.

3d way. 9½ R. 100
2 T. 19
19 Prod. 119 intereſt of 100 for 2 years.

100 : 119 :: 400
400
Amount 476,00
Principal 400
Intereſt Rs. 76 anſwer.

4th way. 4,00
$9\frac{1}{2}$
36
2
38 intereſt for 1 year.

5th way. $9\frac{1}{2}$ R.
2 T.
19 Prod.

400 rs.
10 — $\frac{1}{10}$ — 40
5 — $\frac{1}{2}$ — 20
$2\frac{1}{2}$ — $\frac{1}{2}$ — 10
$1\frac{1}{4}$ — $\frac{1}{2}$ — 5
$\frac{1}{4}$ — $\frac{1}{5}$ — 1
Rs. 76 anſwer.

(2) What is the intereſt of 1020 rupees for a year at $10\frac{1}{2}$ per cent per annum? Anſwer 107rs. 1a. 7p. 20.

(3) What is the amount of 1690 rupees for 3 years at $10\frac{1}{4}$ per cent per annum? Anſwer 2209rs. 10a. 9p. amount.

(4) What is the amount of 1120rs. 10a. for $2\frac{1}{2}$ years at $9\frac{3}{4}$ per cent per annum? Anſwer 1393rs. 12a. 5p. amount.

(5) What is the intereſt of 3400 rupees for $5\frac{3}{4}$ years at $8\frac{3}{4}$ per cent per annum? Anſwer 1710rs. 10a.

C A S E V.

To find the intereſt of any ſum for any certain number of weeks.

RULE.

RULE I.

As 52 weeks
Are to the intereſt of the given ſum for 1 year;
So are the weeks given,
To the intereſt required.

RULE II.

Take parts with the weeks given out of 52, and divide the intereſt of 1 year by thoſe parts; the quotient or ſum of the quotients give the anſwer.

(1) What is the intereſt of 400 rupees for 13 weeks at 9 per cent per annum?

1ſt way. 100 : 9 : : 400

9

Intereſt for 52 weeks 36,00

52 : 36 : : 13

13

52)468(9 rupees anſwer.

468

...

2d way. 36rs. being the intereſt for 52 weeks,

13wks.—$\frac{1}{4}$— 9 rs. anſwer.

(2) What is the intereſt of 1126rs. 12a. for 16 weeks at 11$\frac{1}{2}$ per cent per annum.? Anſwer 39rs. 13a. 10,4cp.

(3) What is the amount of 5000 rupees for 20 weeks at 12 per cent per annum? Anſwer 5230rs. 12a. $3\frac{36}{52}$ p.

(4) What is the intereſt of 600rs. 10a. for 1 year and 20 weeks at 11 per cent per annum? Anſwer 91rs. 7a. $7\frac{44}{52}$ p.

(5) What is the amount of 7100rs. 4a. 9p. for 2 years and 15 weeks at 10 per cent per annum? Anſwer 8725rs. 2a. $7\frac{27}{52}$ p.

CASE VI.

To find the intereſt of any number of days.

RULE I.

Multiply the principal by the days, and by the rate of intereſt for a dividend; and 365 by 100 for a diviſor; the quotient will be the anſwer: which rule is according to a Double Rule of Three ſtating, thus:

100 × 365 : Rate : : Principal × Time : Intereſt

RULE II.

Or as 365 days
Are to the intereſt of the given ſum for a year;
So is the time propoſed
To the Intereſt required.

(1)

(1) What is the intereſt of 1120 rupees for 126 days at 10 per cent per annum? Anſwer 38rs. 10a. $7\frac{109}{365}$ p.

1ſt way. 365 days.
100
36500 diviſor.

1120 principal.
126 days.
6720
13440

365,00)141120,00(38rs.
1095
3162
2920
242
16
365)3872(10 a.
365
222
12
365)2664(p.
2555
109

Anſwer 38rs. 10a. 7p. $\frac{109}{365}$

2d way. 100 : 10 :: 1120
10

Intereſt for 1 year Rs. 112,00

days. int. for 1 year. days.
365 : 112 :: 126
126

672
1344

365)14112(38 rs.
1095

.3162
2920

.242
16

365)3872(10 a.
365

.222
12

365)2664(7 p.
2555

.109

Anſwer 38rs. 10a. 7p. $\frac{109}{365}$

(2) What is the intereſt of 955rs. 10a. for 145 days at 11 per cent per annum? Anſwer 41rs. 12a. 1p. $\frac{195}{365}$

(3) What is the intereſt of 625 rupees from June 1ſt 1783 to March 9th 1784 incluſive at 12 per cent? Anſwer 57rs. 15a. 1p. $\frac{175}{365}$

(4) What is the amount of 500 rupees from January 30th to September 1ſt following, each included at 9 per cent per annum? Anſ. 526rs. 8a. 1p. $\frac{115}{365}$

(5) How many rupees am I to pay for 945rs. 14a. 6p. lying at intereſt from 10th of September 1783 until 16th July 1785, each included at $9\frac{1}{2}$ per cent per annum? Anſwer 1112rs. 1a. 4p. $\frac{85}{365}$

CASE VII.

To find the principal when the amount, time, and rate per cent are given.

RULE

As the amount of 100 rupees at the rate and time given
Is to 100 rupees;
So is the amount given
To the principal required.

Note, Caſe 7th, 8th, and 9th, prove each other.

(1) What principal being put to intereſt for 9 years at 10 per cent per annum will amount to 1725 rupees?

Amt. Rupees. Prin.

10 190 : 100 :: 1725

9 100

90 19,0)17250,0(907 rs.

100 171

190 a. ..150

133

.17

16

19)272(14 a.

19

.82

76

.6

12

19)72(3p.

57

15

Anſwer 907rs. 14a. 3p. $\frac{15}{19}$

(2) What principal being put to intereſt for 7 years will amount to 7930rs. 12a. at 8 per cent per annum? Anſwer 5083rs. 13a. $\frac{4}{156}$

(3) What ſum being put to intereſt will amount to 5200rs. 15a. 8p. in 8 years at 9 per cent per annum? Anſwer 3023rs. 13a. 2p. $\frac{72}{172}$

(4) What ſum being put to intereſt will amount to 20000 rupeesin 5 years at 12 per cent per annum? Anſwer 12500 rupees.

(5) What ſum being put to intereſt for 6 years will amount to 100,000 rupees at 11 per cent per annum? Anſwer 60240rs. 15a. 5p $\frac{100}{166}$

CASE VIII.

To find the rate per cent when the amount, time and principal are given.

RULE.

As the principal
Is to the intereſt for the whole time;
So is 100
To its intereſt for the ſame.

Divide the intereſt laſt found by the time, and the quotient will be the rate per cent.

(1) At what rate of intereſt per cent will 907rs. 14a. 3p. amount to 1725 rupees in 9 years' time?

Amt. 1725 rupees.
907 14 3

907rs. 14a. 3p. : 817rs. 1a. 9p. : : 100 rs.

907rs. 14a. 3p. :	817rs. 1a. 9p. : :	100 rs.
16	16	16
14526 a.	13073 a.	1600 a.
12	12	12
174315 p.	156885 p.	19200 p.

156885
19200
31377000
2980815

174315)3012192000(17280 p.
174315
1269042
1220205
..488370
348630
1397400
1394520
..28800

12
1440 a.
16
90 rs.
9
10 rate per cent.

Anſwer 10 per cent. $\frac{28800}{174315}$

(2) At what rate of intereſt per cent will 5083rs. 13a. amount to 7930rs. 12a. in 7 years? Anſwer 8 $\frac{64}{81341}$ per cent.

(3) At what rate of intereſt per cent will 3023rs. 13a. 8p. amount to 5200rs. 15a. 8p. in 8 years? Anſwer 9 $\frac{13824}{580374}$ per cent.

(4) At what rate of intereſt per cent will 12500rs. amount to 20000 rupees in 5 years time? Anſwer 12 per cent.

(5)

(5) At what rate of intereſt per cent will 60240rs. 15a. 5p. amount to 1 lack rupees in 6 years? Anſwer 11 $\frac{1920}{11566265}$ per cent.

CASE IX.

To find the time, when the principal, amount and rate per cent are given.

RULE.

As the intereſt of the principal for 1 year at the given rate,
Is to one year;
So is the whole intereſt
To the time required.

(1) In what time will 907rs. 14a. 3p. amount to 1725rs. at 10 per cent per annum?

rupees.		rate per cent.		prin.		
100	:	10	: :	907rs.	14a.	3p.
						10
				Rs. 90,78	14	6
					16	
				a.	12,62	
					12	
				p.	7,50	

90rs. 12a. 7p. $\frac{5}{10}$ int. for 1 year.

	rs.	a.	p.
Amount	1725		
Prin.	907	14	3
Whole int. rs.	817	1	9

int. for 1 year.	year.	whole int.
90rs. 12a. 7p. :	1 : :	817rs. 1a. 9p.
16		16
1452 a.		13073 a.
12		12
17431 p.		17431)156885(9 years:
		156879
		·····6

Anſwer $9\frac{6}{17431}$ years.

(2) In what time will 5083rs. 13a. amount to 7930rs. 12a. at 8 per cent per annum? Anſwer $7\frac{3}{78087}$ years.

(3) In what time will 3023rs. 13a. 2p. amount to 5200rs. 15a. 8p. at 9 per cent per annum? Anſwer $8\frac{8}{52251}$ years.

(4) In what time will 12500 rupees amount to 20000 rupees at 12 per cent per annum? Anſwer 5 years.

(5) In what time will 60240rs. 15a. 5p. amount to 1 lack rupees at 11 per cent per annum? Anſwer $6\frac{1}{1172289}$ years

FACTORS ALLOWANCES.

COMMONLY CALLED

COMMISSION OR PROVISION,

WHICH are allowances from merchants to their agents or factors beyond the ſeas, in the buying, or ſelling, of any ſorts of goods, and is a certain rate per cent according to the cuſtom of the country, where the factor reſides.

RULE.

Calculate the commiſſion, as in Caſe 1ſt of Simple Intereſt for 1 year.

(1) My factor ſends me word that he has bought goods to the value of 1109rs 8a. 4p. upon my account; I demand what his commiſſion comes to at 3½ per cent?

1ſt way. 100 : 3½ :: 1109rs. 8a. 4p.
3½

3328 9 0
½—½— 554 12 2

Rs. 38,83 5 2
16

a. 13,33
12

p. 3.98

Anſwer 38rs. 13a. 3.98p. commiſſion.

(2)

2d way. 1109rs. 8a. 4p.

2 rs. — $\frac{1}{50}$ — 22 3 0
1 — $\frac{1}{2}$ — 11 1 6
$\frac{1}{2}$ — $\frac{1}{2}$ — 5 8 9

Rs. 38 13 3 anſwer.

(2) Negotiated bills on account of A. C. to the amount of 1400 rupees, what is my commiſſion at $1\frac{6}{8}$ per cent? Anſwer 24rs, 8a.

(3) My correſpondent has diſburſed on my account the ſum of 1009rs. 8a. what muſt he demand for his commiſſion, when I allow him $2\frac{1}{4}$ per cent? Anſwer 22rs. 11a. 5,52p.

(4) Suppoſe I allow my correſpondent $1\frac{3}{4}$ per cent for proviſion, what may he demand on the diſburſement of 704rs. 15a. 4p.? Anſwer 12rs. 5a. 4,60p.

(5) Suppoſe I diſburſe on account of my correſpondent at Madras the ſum of 8009rs. 8a. 6p. at $2\frac{1}{2}$ per cent, what will my bill amount to? Anſwer 8209rs. 12a. 3p.

BROKAGE.

BROKAGE is an allowance to perſons called Brokers at a certain rate per cent for finding cuſtomers, and ſelling to them the goods of other men, whether natives or ſtrangers.

RULE.

RULE.

Divide the given ſum by 100, and take parts from the quotient with the rate per cent; but if the brokage ſhould exceed 1 per cent the operation will be the ſame as in Caſe 1ſt of Simple Intereſt for 1 year.

(1) What is the brokage of 700rs. 14a. 6p. at 12a. per cent?

1ſt way.

7,00rs. 14a. 6p.
16

,14
12

p. 1.74

	rs.	a.	p.
	7rs.	0a.	1p.
8a.—½—	3	8	0
4a.—½—	1	12	0
Rs.	5	4	0 brokage anſwer.

2d way.

	rs.	a.	p.
	700rs.	14a.	6p.
8a.—½—	350	7	3
4a.—½—	175	3	7
rs.	5,25	10	10

16

a. 4,10
12

p. 1,30

Anſwer 5rs. 4a. 1p. brokage.

(2) What may a broker demand for brokage, when he ſells goods to the value of 500rs. 10a. 7p. and I allow him 14a. per cent.? Anſwer 4rs. 6a.

(3) Suppoſe I employ a broker, who ſells goods to the value of 909rs. 14a. 10p. what is the brokage at 1½ per cent? Anſwer 13rs. 10a. 4p.

(4) I have ſold goods for my correſpondent to the amount of 1408rs. 12a. 6p. who allows me 8a. per cent; what is the amount of my brokage? Anſwer 7rs. 0a. 8p.

(5) What is the amount of my bill in diſburſing of 1250 rupees at 10a. per cent? Anſwer 1257rs. 13a.

INSURANCE

IS paid by one merchant to another, or to a company for enſuring his ſhips, goods, &c. that is engaging to make good the value inſured, if the ſame be loſt or damaged.

RULE.

Calculate the inſurance, as in Caſe 1ſt of Simple Intereſt for 1 year.

(1) Inſured 4720rs. 13a. on the ſhip Sea Horſe, for the preſent voyage to Madras, inſurance at 14¼ per cent, what does it amount to?

1ſt way. 100 : 14¼ : : 4720rs. 13a.

14¼

66091 6

¼—¼—1180 3 3

rs. 672,71 9 3

16

a. 11,45

12

p. 5,43

Anſwer 672rs. 11a. 5,43p. inſurance.

4720rs. 13a.

10r.	—$\frac{1}{10}$—	472	1	3
2r.	—$\frac{1}{5}$—	94	6	8
2r.	—$\frac{1}{5}$—	94	6	8
¼r.	—$\frac{1}{8}$—	11	12	10
Anſwer	rs.	672	11	5 inſurance.

(2) Bought by order of James Durand of Bombay, and for his account, 400 bags of ſalt-petre, which coſt 20000rs. 9a. 6p. which I inſured at 15 per cent, and charged commiſſion on the amount purchaſe and inſurance at 2½ per cent; I demand the inſurance and commiſſion on the ſame? Anſwer 3000rs. 1a. 5,10p. inſurance, 575rs. 0a. 3,27p. commiſſion on the whole.

(3)

(3(Inſured the ſhip Betſey Captain Saumarez, on a voyage to China. She and her cargo being valued at 80000 rupees, inſurance at 16$\frac{3}{4}$ per cent, what is the inſurance ? Anſwer 13400 rupees.

(4) My correſpondent adviſes me that he has ſhipped on board the Spitfire ſnow 100 pieces of Madras cloth at 56 rupees per piece, which he has inſured at 14$\frac{1}{4}$ per cent, charged me with commiſſion at 2 per cent, and drawn on me for the amount. What is that? Anſwer 6525rs. 15a. 4p.

(5) What is the inſurance of 100 cheſts of opium each valued at 450 rupees, ſent to Rangoon in the Charlotte at 12$\frac{3}{4}$ per cent ? Anſwer 5737rs. 8a.

ANNUITIES AND PENSIONS IN ARREARS.

AN Annuity or Penſion is ſuppoſed payable upon the day it becomes due ; but if it be forborn, i. e. unpaid, beyond that day, it is then in Arrear.

RULE.

Find the intereſt of the given annuity for 1 year, and then for 2, 3, &c. years, up to the given time, leſs 1; multiply the annuity by the number of years given, then add the ſeveral intereſts and the product into one ſum.

(1)

(1) If an annuity of 4000 rupees be forborn 5 years, what will be due for principal and intereſt at the end of the ſaid term, ſimple intereſt being computed at 9 per cent per annum?

4000 rs.
9
Int. 360,00

Intereſt of 4000rs. at 9 per cent
for 1 year, = 360 rs.
2 —— 720
3 —— 1080
4 —— 1440
4000 × 5 = 20000
Anſwer rs. 23600 due.

4000 annuity.
5
rs. 20000 five years' annuity.

(2) A houſe being let upon a leaſe of 12 months at 500 rupees per month, and the rent being in arrear for the whole term, I demand the ſum due at the end of the term, ſimple intereſt being allowed at 12 per cent? Anſwer 6330 rupees.

(3) If the payment of a penſion be omitted 7 years, what will it amount to in that time ſuppoſing it to be 1500 rupees at 6 per cent? Anſwer 12390 rupees.

(4) Suppoſe a ſalary of 1000 rupees per month be forborn 7 months, what is the amount at 8 per cent per annum? Anſwer 7140 rupees.

(5) If 1800 rupees annuity, payable every half year, were unpaid 5 years, what will it amount to in that time at 7 per cent? Anſwer 20835 rupees.

COMPOUND INTEREST,

OR

INTEREST UPON INTEREST.

IS that which ariſes from any principal and its intereſt put together, and though it is not lawful to let out money in that manner, yet in purchaſing of annuities or penſions, and leaſes in reverſion, it is commonly allowed to the purchaſer for his ready money.

RULE.

To find the compound intereſt of any given ſum for any number of years, find the amount of the given ſum by Simple Intereſt for the firſt year, which is the principal for the ſecond year, then find the amount of that principal for the ſecond year, and that is the principal for the third year, and ſo on for any number of given years; then ſubſtract the ſum from the laſt amount, and the remainder is the compound Intereſt required.

(1) What will be the amount and compound intereſt of 1000 rupees in three years' time at 12 per cent per annum?

100 : 12 : :	1000	1000rs. principal for 1 year.
	12	120 intereſt.
Int. for 1 year,	120,00	rs. 1120 amount.

100 : 12 : : 1120 1120rs. a. p. prin. for 2d year.
12 134 6 4 intereſt.

rs. 134,40 1254 6 4 amount.
16

a. 6,40
12

p. 4,80

100 : 12 : : 1254rs. 6a. 4p.
12

rs. 150,52 12 0
16

a. 8,44
12

p. 5,28

1254rs. 6a. 4p. principal for 3d year.
150 8 5 intereſt.

rs. 1404 14 9 amount anſwer.
1000 ——— principal.

rs. 404 14 9 compound intereſt. anſwer.

2d way. 1000 principal.
10rs —$\frac{1}{10}$— 100
2rs.—$\frac{1}{5}$— 20

rs. 1120 amount for 1ſt year.
10rs.—$\frac{1}{10}$— 112
2rs.—$\frac{1}{5}$— 22 6 4

rs: 1254 6 4 amount for 2d year.

rs. 1254

	rs.	1254	6	4	amount for 2d year.
10rs.—$\frac{1}{10}$—		125	7	0	
2rs.—$\frac{1}{5}$—		25	1	5	
anſwer	rs.	1404	14	9	amount for 3d year.
	rs.	1000			principal.
anſwer	rs.	404	14	9	compound intereſt.

(2) What is the compound intereſt of 1200 rupees for 3 years at 12 per cent per annum? Anſwer 485rs. 14a. 6p.

(3) What ſum will 1500 rupees amount to in 4 years' time at 11½ per cent per annum compound intereſt? Anſwer 2318rs. 6a. 5p.

(4) What is the compound intereſt of 500rs. 12a. for 5½ years at 10 per cent per annum? Anſwer 346rs. 0a. 3p.

(5) What ſum will 945rs. 12a. 11p. amount to in 7 years' time at 11¾ per cent per annum compound intereſt? Anſwer 2058rs. 6a. 5p.

EXCHANGE.

IS the giving of money, weight, or meaſure of one country for the like value in bills, money, weight, or meaſure of another country.

BATTA.

IS the reducing or changing rupees of all denominations in coin to currency, an imaginary coin ſo called, of which 12 current pice are 1 current anna, 16 current annas 1 current rupee, and the difference in the value between rupees in ſpecie and current rupees is called Batta.

To this currency muſt all the real ſpecie be turned or reduced, before any ſum or ſums can be regularly entered into a merchant's book or books of accounts.

RULE.

To reduce ſicca rupees to current rupees multiply the ſum given by 116, (when they are 16 per cent better than current rupees) and divide that ſum by 100, the quotient will be the ſum required in current rupees.

To reduce current rupees to ſicca ſpecie multiply the ſum given by 100, and divide that product by 116, the quotient will be the ſum required in ſicca ſpecie.

In like manner may all rupees be reduced to currency, or currency to thoſe, regarding how much they are better than current.

NOTE.

NOTE.

100 Sicca Rs. are	116 Ct. Rs.	S.Rs. A.P.
100 Madras Arcot.	108	93 1 7
100 Bombay Soorte	110	94 13 9
100 Mooney Soorte	109	94 0 0
100 Sonaut Fooly	113	97 9 3
100 Old Sonaut	111	95 11 2
100 Patna Sonaut	111	95 11 2
100 Firkabad	112 8	87 8 0
100 Moorſhedabad	111	95 12 0
100 Mochedah	109	94 0 0
100 Lucknow	113 8	97 14 0
100 Duſs Maſſa	110	94 13 9
100 Current Rs.		86 3 4

But as the prices of the above rupees are continually fluctuating, they are not to be depended upon.

(1) In 9470 ſicca rupees, how many current rupees?

By given rule
1ſt way.

ſ.rs. 9470
116

56820
104170

rs. 10985,20
16

a. 3,20
12

p. 2,40

Anſ. 10985rs. 3a. 2p.

By Practice.
2d way.

9470 ſ. rs.
10rs $\frac{1}{10}$ — 947
5 — $\frac{1}{2}$ — 473 8
1 — $\frac{1}{5}$ — 94 11 2 $\frac{2}{5}$

c. rs. 10985 3 2 $\frac{2}{5}$

By rule 1ſt in Caſe 1ſt of Simple Intereſt.

3d way. 100 : 16 : : 9470

16

rs. 1515,20

16

a. 3,20

12

p. 2,40

ſ. rs. 9470

batta 1515 3 2

c. rs. 10985 3 2 Anſwer.

By rule 4th in Caſe 1ſt of Simple Intereſt.

4th way. rs. 94,70

16

a. 11,20

12

p. 2,40

94ſ.rs. 11a. 2,40p.

16

1515 3 2,40

9470

Anſ. 10985 3 2,40

*(2) In 10985 c. rs. 3a. 2p. how many ſicca rupees ?

10985 c.rs. 3a. 2p.
16

175763 a.
12

116) 210915800 (1818239 p.
116 12
a. 151519 11
·949 16
928 ſ. rs. 9469 15 11

·211
116

·955
928

·278
232

·460
348

1120
1044

··76

Anſwer 9469 ſ.rs. 15a. 11p. $\frac{76}{116}$

* This ſum alſo provesthe foregoing.

(3) Reduce 1147 ſ.rs. 14a. 4p. into current rupees ?
Anſwer 1331 c.r.s. 8a. 11p.

(4) Reduce 1331 c.rs. 8a. 10p. into ſicca rupees ?
Anſwer 1147 ſ.rs. 14a. 2p. $\frac{96}{116}$

(5) In 739 Arcot rupees at 8 per cent better than current rupees how many current rupees? Anſwer 798 c.rs. 1a. 11p. $\frac{4}{100}$

(6) In 798 c.rs. 1a. 11p. how many Arcot rupees? Anſwer 738 c.rs. 15a. 11p. $\frac{104}{116}$

(7) In 635 Bombay ſoorte rupees how many current rupees? Anſwer 698 c.rs. 8a.

(8) In 864rs. 12a. 9p. of Bombay how many current rupees? Anſwer 951 c.rs. 4a. 5p.

(9) In 686 c.rs. 7a. 7p. how many mooney ſoorte rupees? Anſwer 629rs. 12a. 8p. $\frac{20}{109}$ mooney ſoorte.

(10) In 637rs. 10a. at $5\frac{1}{2}$ per cent better than current rupees how many current rupees? Anſwer 672 c.rs. 11a. 1p. $\frac{32}{100}$

(11) In 76rs. 4a. 6p. at 3rs. 2a. per cent better than current rupees how many current rupees are there? Anſwer 78 c.rs. 10a. 7p. $\frac{132}{192}$

(12) In 755 Mochedah rupees how many current rupees? Anſwer 822 c.rs. 15a. 2p. $\frac{4}{10}$

(13) In 375rs. 8a. 6p. at $7\frac{3}{4}$ per cent better than current rupees how many current rupees? Anſwer 404 c.rs. 10a. 1p. $\frac{9}{10}$

(14) In 672 c.rs. 11a. 1p. how many rupees at $5\frac{1}{2}$ per cent better than current rupees? Anſwer 637rs. 9a. 10p. $\frac{179}{211}$

(15) In 83c.rs. 14a. 6p. how many rupees are there at $4\frac{1}{2}$ per cent better than current rupees? Anſwer 80rs. 7a. 9p. $\frac{47532}{200118}$

(16) In 802 c.rs. 3a. how many mochedah rupees? Anſwer 735rs. 15a. 2p. $\frac{1312}{1744}$ mochedah.

(17) In 404 c rs. 13a. 2p. how many rupees at $7\frac{3}{4}$ per cent better than current rupees? Anſwer 375rs. 11a. 3p. $\frac{10320}{20688}$

(18) My debtor deſires me to ſend my ſircar for the balance of account, viz. 1764 c.rs. 8a. 11p. how many ſicca rupees muſt he receive? Anſwer 1521 ſ.rs. 2a. 8p. $\frac{76}{118}$

(19) Received on account of A.B. 1557 Lucknow rupees, how many rupees current may I give him credit for at 13rs. 8a. per cent better than current rupees? Anſwer 1767 c.rs. 3a. 1p. $\frac{44}{100}$

(20) What is the value in Lucknow rupees at 13rs. 8a. per cent better than current of 1050 current rupees? Anſwer 925rs. 1a. 9p. $\frac{264}{1816}$

(21) Drew upon A. B. of Firkhabad for 5000rs. 8a. 10p. what number of rupees of that place muſt he anſwer for at 12rs 8a. per cent better than current? Anſwer 4444rs. 14a. 11p. $\frac{120}{216}$ of Firkhabad.

(22) In 999 Moorſhedabad rupees at 11 per cent better than current how many current rupees? Anſwer 1108c.rs. 14a. 2p. $\frac{89}{100}$

(23) What number of rupees of Moorſhedabad ſhould A. and B. anſwer for a bill drawn on them for 5000 current rupees, when the Moorſhedabad rupees are 11 per cent better than current? Anſwer 4504rs. 8a. $\frac{8}{111}$

(24) How many current rupees muſt I credit A. and B. of Firkhabad for 2470 rupees of that place remitted to me at 12rs. 8a. per cent better than current rupees? Anſwer 2778rs. 12a.

BENGAL.

TO reduce rupees in coin of one country to rupees of another country bearing different centages.

RULE.

Multiply the ſum you want to reduce to any other kind by 100 increaſed by the centage of its own kind, and divide the product by 100 increaſed by the centage of that kind, you would have it reduced to. The quotient will be the anſwer.

Prove ſums in this rule by varying the queſtions.

(1) In 1000 Lucknow rupees at 13 per cent better than current rupees how many ſicca rupees at 16 per cent better than current rupees?

```
            1000rs.
             113
116)113000(974 ſ rs.
    1044
    ·860
     812
     ·480
      464
      · 16
        16
   116)256(2 a.
       232
       · 24
         12
   116 288(2 p.
       232
       · 56
```

Anſwer 974 ſ.rs. 2a. 2p. $\frac{56}{116}$

(2)

(2) In 750 ſicca rupees how many Lucknow rupees at 13 per cent better than current rupees? Anſwer 810rs. 15a. 6p. $\frac{102}{113}$ of Lucknow.

(3) In 500 Madras Arcot rupees how many ſicca rupees? Anſwer 465ſ.rs. 8a. 3p. $\frac{36}{118}$

(4) In 910 ſicca rupees how many Arcot rupees? Anſwer 977rs. 6a. 6p. $\frac{24}{108}$ Arcot.

(5) In Patna ſonaut rupees 910rs. 14a. 6p. how many Moorſhedabad rupees? Anſwer 894rs. 7a. 10p. $\frac{84}{111}$ of Morſhedabad.

(6) In Bombay ſoorte rupees 1640rs. 15a. 3p. how many Mochedah rupees? Anſwer 1656rs. 0a. 1p. $\frac{53}{109}$ Mochedah.

(7) In 810ſ.rs. 5a. 4p. how many Patna ſonaut rupees? Anſwer 862rs. 5a. 11p. $\frac{69}{109}$ Patna ſonaut.

(8) In Firkhabad rupees 373rs. 10a. 4p. how many old ſonaut rupees? Anſwer 403rs. 3a. 5p. $\frac{444}{1068}$ old ſonaut.

L O N D O N.

TO change rupees into pounds ſterling, and *vice verſa.*

RULE.

To change rupees into pounds ſterling, multiply the rupees given, by the pence given in 1 rupee, and divide by 12 and 20.

To change pounds ſterling into rupees, reduce the pounds given to pence, and divide by the pence given in one rupee.

Note, To change pounds ſterling into ſicca rupees, when the exchange is at two and three pence the current rupee, put two cyphers to the ſhillings in the ſum given, and divide that by 261, the number of ſhillings in 100 ſicca rupees at that rate. And to change ſicca rupees into pounds at the ſame rate of exchange, multiply the given ſum by *261, cut off the two right-hand figures in the product, and thoſe on the left give the anſwer in ſhillings. If the exchange is at two ſhillings the current rupee, take 232 for a common multiplier and diviſor inſtead of 261, and the operation may be performed as otherwiſe directed.

The current rupee was formerly valued by the Honourable Company at 2s. 3d. ſterling, but now at 1s. 11d. in remittances, and by private merchants is ſeldom exchanged for more than 2s. 1d.

Prove queſtions in this rule by varying them.

(1) What is the value in current rupees each 2s. 3d. of 980l. 10s. 11d.?

---

* 261 is the number of ſhillings in 100 ſ.rs. at 2s. 3d. per current rupee.

2s. 3d.
12
27d. in 1 rupee.

980l 10s. 11d.
20
19610s.
12
27)235331(8715 c.rs.
216
193
189
43
27
161
135
26
16
27)416(15 a.
27
146
135
11
12
27)132(4 p.
108
24

Anſwer 8715 c. rs. 15a. 4p. $\frac{24}{27}$

(2)

(2) In 7513ſ.rs. 12a. 2p. how many pounds ſterling when the current rupee is valued at 2ſ. 3d.

1ſt way.

	ſ.rs.	a.	p.
	7513	12	2
10rs.—$\frac{1}{10}$—	751	6	0
5 — $\frac{1}{2}$ —	375	11	0
1 — $\frac{1}{5}$ —	75	2	2
c. rs.	8715	15	4

```
 1c.r. : 27d. : : 8715c.rs. 15a. 4p.
16a.                    16
12                  ------
---                 139455 a.
192 p.                  12
                   -------
                   1673464 p.
                        27
                  --------
                  11714248
                  3346928
                  ---------12
              192)45183528(235330
                  384          ------
                  ---     s. 1961,0  10
                   678    2,0-------
                   576       l. 980  10  10 3/4 96/192
                   ---
                   1023
                    960
                   ----
                     635
                     576
                     ---
                      592
                      576
                      ---
                      108
                        4
                      ---
                  192)072(3
                      576
                      ---
                       96
```

Answer 980l. 10s. 10d. $\frac{3}{4}\frac{96}{192}$

2d way. 8715c,rs. 15a 4p.
27

61005
17430
8a. — $\frac{1}{2}$ — 13 $\frac{1}{2}$
5 4p. — $\frac{1}{3}$ — 9
2 — $\frac{1}{4}$ — 3 $\frac{1}{4}$

d. 235330 $\frac{3}{4}$
12

s. 19610 10 $\frac{3}{4}$
2,0

l. 980 10 10 $\frac{3}{4}$

3d. way. 7513ſ.rs. 12a. 2p.
261

7513
45078
15026
8a. — $\frac{1}{2}$ — 130
4a. — $\frac{1}{2}$ — 65
—2p. — $\frac{1}{24}$ — 2

s. 19610,90
12

d. 10,80
4

3,20

s. 19610 10d $\frac{3}{4}$
2,0

l. 980 10 10 $\frac{3}{4}$ Anſwer.

(3)

(3) Remitted 10000 ſicca rupees into the Company's Treaſury at Calcutta, which I am to receive in London at 1s. 11d. per current rupee, what is the amount in pounds ſterling? Anſwer 1111l. 13s. 4d.

(4) A bill drawn upon the Honourable Company's Treaſury at Calcutta, for which I have paid at their houſe in London the ſum of 409l. 10s. 11d. $\frac{3}{4}$ is this day to be paid, what am I to receive in ſicca ſpecie, the current rupee being valued at 2s. 2d. each? Anſwer 3259 ſ.rs. 0a. 1p. $\frac{6912}{22272}$

(5) The amount of a bill preſented to me for payment for ſome cordage which I have received is 730l. 2s. 6d. what is the amount in current rupees each valued at 2s. 3d. and how many ſicca rupees muſt I pay him? Anſwer 6490 current rupees, and 5594 ſ.rs. 13a. 2$\frac{4}{116}$

(6) The ſum of a gunner's inveſtment being diſpoſed of to me is 350 pounds ſterling, which I am to pay at 2s. 2d. per current rupee. What is the amount in currency? Anſwer 3230 c.rs. 12a. 3p. $\frac{18}{26}$

(7) Purchaſed the captain's inveſtment of the ſhip Glatton at 75 per cent on the invoice, which amounts to 8500l. 10s. what muſt I pay him in ſicca ſpecie, the current rupee being valued at 2s. 1d. Anſwer 123110 ſ.rs. 10a. 10p. $\frac{84}{116}$

(8) Twelve diamonds valued at 1500 ſicca rupees each are remitted to England, for which the owners are to receive ſterling money, what will it amount to, the current rupee being valued at 2s. each? Anſwer 2088 pounds.

(9) Purchaſed a quantity of ſtationery, prime coſt in England 500 pounds, for which I am to pay 25 per cent, and ſome glaſs amounting to 750 pounds which is to be paid for at 50 per cent upon the invoice, what am I to pay in ſicca ſpecie, when the current rupee is valued at 2s. 3d. each ? Anſwer 13409 ſ.rs. 15a. 4p. $\frac{168}{261}$

(10) Bought goods of A. and B. to the amount of 1100 ſicca rupees to be paid in England at 2s. 1d. the current rupee, and the money bearing intereſt at 12 per cent, I demand the amount in ſterling money, when the ſhip was juſt 7 months on her paſſage ? Anſwer 142l. 4s. 5d.$\frac{1}{2}$

(11) An amount of an inveſtment conſigned to me is 1000l. ſterling, what am I indebted in current rupees at 2s. 2d. each, after having ſold the above at 55 per cent upon the invoice, and charging 1 per cent commiſſion ? Anſwer 14164 c.rs. 9a. 10p. $\frac{4}{26}$

(12) Lent on reſpondentia at 25 per cent for the voyage to the ſupercargo of the Daniſh ſhip Fredrick 4830 ſicca rupees, what does he ſtand indebted to me on his arrival at Port when the current rupee is valued at 2s 3d. ? Anſwer 796l. 1ſ.

MADRAS.

MADRAS exchanges with Calcutta for the ſtar pagoda, which at the par of exchange is 345 Arcot rupees, per 100 ſtar pagodas.

They keep their accounts thus:

80 caſh	make	. . . . 1 fanam.
45 fanams		. . . . 1 ſtar pagoda.

To reduce Bengal money into Madras money, and *vice verſa.*

RULE.

To reduce Bengal money into Madras money.

As 345 Arcot rupees are to 100 ſtar pagodas,
So are the Arcot rupees of the ſum given, to its value in ſtar pagodas.

To reduce Madras money into Bengal money.

As 100 ſtar pagodas are to 345 Arcot rupees,
So are the pagodas given to their value in Arcot rupees, which muſt be reduced to the rupees required.

To prove ſums in this rule, reverſe the queſtion.

(1) Calcutta draws upon Madras for 900 ſicca rupees, what ſum muſt Madras anſwer for that in ſtar pagodas?

```
              900 ſicca rupees.
              116
        108)104400(966 a.rs.
            972
            ·720
             648
             ·720
              648
              · 72
               16
         108)1152(10 a.
             108
             ··72
               12
          108)864(8 p.
              864
              ···
              ═══
```

345 c.rs. : 100 ſ.ps. :: 966 c.rs. 10a. 8p.

16   16

5520 a.   15466 a.

12   12

66240 p.   66240)185600,00(280 ſ. ps.

13248

53120

52992

1280

45

6400

5120

6624)57600(8 f

52992

4608

80

6624)368640(55 c.

33120

37440

33120

4320

Anſ. 280ſ. ps. 8f. 55c. $\frac{4320}{6624}$

(2) Purchaſed 500 pagodas at 3 ſ.rs. 12a. per pagoda, what do they amount to? Anſwer 1875 ſicca rupees.

(3) What ſum in current rupees muſt I anſwer for a bill drawn on me for 520 ſtar pagodas exchange at par? Anſwer 1937 c.rs. 8a. 3p. $\frac{84}{100}$

(4)

(4) To what amount in pagodas is my correſpondent at Madras to credit me for having remitted a bill payable to him for 4968 current rupees exchange at 345 Arcot rupees per 100 ſtar pagodas? Anſwer 1333 ſ. ps. 1 f.

BOMBAY.

BOMBAY exchanges with Calcutta for the rupee of that place 100 of which at the par of exchange make 110 current rupees.

They keep their accounts thus:

100 reas — make — 1 quarter rupee,
4 quarters — — 1 rupee ſoorte.

Obſerve the ſame rule as in Bengal.

(1) Drew upon my friend Dick Horner of Bombay for 5000 ſicca rupees, what ſum muſt he anſwer for that in rupees of that place at 10 per cent better than current rupees?

5000
116
———
58000,0
11,0———
rs 5272 8
4
—
32
11—
qrs. 2 10
100
———
1000
11———
rs. $90\frac{10}{11}$

Anſwer 5272rs. 2qrs. 90 reas $\frac{10}{11}$

(2) Paid a bill drawn upon me for 2000 rs. 3 qrs. 90 reas. of Bombay, what muſt I charge the debtor for in current rupees? Anſwer 2201 rs. 1 a. 1 p. $\frac{368}{400}$

(3) Conſigned to J. B. at Bombay 5000 maunds of ſalt petre, which he informs me, he has diſpoſed of in rupees of that place at 3 rs. 2 qrs. 40 reas per maund, what ſum in current rupees am I to charge him with, after allowing him a commiſſion of 2 per cent on the ſale? Anſwer 19404 current rupees.

(4) Remitted to J. B. at Bombay a draft on a houſe there for 2956 ſicca rupees, what ſum in Bombay rupees is he to credit me for? Anſwer 3117 rs. 0 qrs. 94 rs. $\frac{6}{11}$ of Bombay.

COMPARISON of WEIGHTS and MEASURES.

Note 1. 80 ſiccas weight, are 1 Calcutta ſeer,
60 ditto, 1 Serampore ditto,
82 ditto, 1 Hoogley ditto,
84 ditto, 1 Benares ditto,
96 ditto, 1 Ellahabad ditto,
84 ditto, 1 Mizapoor ditto,
96 ditto, 1 Lucknow ditto,
72 ditto, 11 annas 12 gundas 2 cowries 1 factory ditto,

A ſicca is equal to 7 dwts. 11 $\frac{2}{3}$ grains Troy.

Note 2. The factory maund. as ſettled by the merchants of Calcutta, is equal to 2909 ſa. wt. 1 a. 10 g. or lbs. 74,666 or 10 oz. 10,666 dwts. which makes the ſeer equal to ſa. wt. 72. 11 a. 12 g. 2 c. or lbs. 1,8666 or 1

1 lb. 13 oz. 13,866 dwts. and the chahtack equal to 4ſa. wt. 8 a. 14 g. 2 c. or lb. 11666 or 1 oz. 12,866 dwts.

A bazar maund is 10 per cent more than a factory maund, and equal to 3200 ſa. wts. or lbs 82,1333 or 2 oz. 2,133 dwts.

A bazar ſeer is equal to 80 ſa. wt. or lbs. 2,05333 or 2 lbs. 0 oz. 13,6533 dwts. and the cht. equal to 5 ſa. wt. or lbs. ,12833 or 2 oz. 0,8533 dwts.

cwt.	is equal to	br md.	ſrs.	chs.	or	f.m.	ſ.	chs.
1		1	14	8,7272		1	20	0
1 lb.				7,7922				8,57

36ſrs. 5chs. $\frac{3}{4}$ bazar weight, is equal to 1 factory maund,
1 maund bazar weight, = 44 factory ſeers,
10 bazar maunds, = 11 factorymaunds,
1 md. 20 ſrs. factory weight, = 1 cwt.
3 maunds factory weight, = 2 cwt.
15 maunds bazar weight, = 11 cwt.

CASE I.

To change maunds of one place, into maunds of another place.

RULE

As 1 ſeer of the weight given: is to its ſiccas:: ſo is the weight given: to its ſiccas, which divide by the ſiccas in a ſeer of the place, you wiſh to change them to, will give the anſwer ſought in ſeers of that place.

Let it be required to find how many maunds of Calcutta are in 500 mds. 20 ſrs. of Lucknow?

L.

```
L. ſr.  ſs.   L.mds. ſrs.
  1  :  96 : : 500  20,
                 40
            ---------
             20020 ſrs.
                96
            ---------
            120120
           180180
           ----------
           192192,0
      8,0  ---------
             2402,4
        4,0  ------
```

Calcutta Mds. 600 24 ſrs. Anſwer?

(2) In 875 mds. 10 ſrs. 14 chs. of Lucknow at 96 ſiccas per ſeer, how many Calcutta ſeers? Anſr. 42013 $\frac{4}{80}$ Calcutta ſeers.

(3) In 10 mds. 5 ſrs. 8 chs. of Hoogly, how many Calcutta maunds? Anſr. 10 mds. 15ſ. $\frac{51}{80}$ of Calcutta.

(4) If 75 maunds of Bengal are equal to 125 maunds of Bombay, how many maunds of Bengal will make 5965 maunds of Bombay? Anſr. 1988mds. 13ſrs. 5chs. $\frac{75}{225}$ of Bengal.

(5) In 500 Hoogly maunds how many Calcutta mds? Anſr. 512 mds. 20 ſrs. of Calcutta.

CASE II.

To change factory maunds into bazar maunds, and vice verſa.

RULE

RULE

To change factory maunds into bazar maunds

multiply by $\left\{\begin{array}{c}10\\ \text{or}\\ 40\end{array}\right\}$ and divide by $\left\{\begin{array}{c}11\\ \text{or}\\ 44\end{array}\right\}$

To change bazar maunds into factory maunds

multiply by $\left\{\begin{array}{c}11\\ \text{or}\\ 44\end{array}\right\}$ and divide by $\left\{\begin{array}{c}10\\ \text{or}\\ 40\end{array}\right\}$

2dly. by reducing the weight given into ſiccas according to Caſe 1ſt. or 3rdly. to reduce bazar maunds into factory maunds by adding 10 per cent to the weightgiven.

(1) In 980 mds. 10 ſrs. bazar weight how many maunds factory weight?

		b. mds.	ſrs.
1ſt. way		980	10
			11
		10782	30
	10	1078	11 Anſwer.

	b. mds.	ſrs.
2nd. way	980	10
	40	
	39210	ſrs.
	44	
	156840	
	156840	
	4,0)172524,0	

4,0

4,0)172524,0
4,0)4313,1
maunds 1078 11 Anſwer.

3rd. way b. mds. ſrs.
980 10
40
39210 ſrs
80
3136800 ſiccas.
16
50188800
20
1003776000
4
4,0
93090)4015104000(4313,1 ſrs.
372360
mds 1078 11 ſrs Anſwer.
.291504
279270
.122340
93090
.292500
279270
.132300
93090
.39210

4th. way b. mds ſrs
980 10
10

maunds 98,02 20
40

1,00

b. mds ſrs
980 10
98 1

maunds 1078 11 ſrs. Anſwer.

(2) If 40 ſrs. of bazar weight are equal to 44 ſrs. factory wt. how many bazar ſrs. are in 99 mds. 10 ſrs. factory weight? Anſr. 3609 ſrs. 1 ch. $\frac{20}{44}$

(3) In 89 mds. of Lucknow, how many factory maunds are there? Anſr. 117 mds. 19 ſrs. 3 chs. factory weight.

(4) In 510 mds. 30 ſrs. factory wt. how many Hoogley ſrs. are there? Anſr. 18119 ſrs. 8 chs. of Hoogley.

(5) Required the factory weight of 100 bazar maunds of copper? Anſr. 110 factory mds.

CASE III.

To change maunds into Avoirdupois weight and *vice verſa.*

RULE

To bring factory weight into Avoirdupois weight.

ſ. md.

1 f. md. 20 frs. : 1 cwt.
3 f. md. : 2 cwt. } :: the factory weight given: to the factory weight required.

To bring Avoirdupois weight into factory weight.

1 cwt: 1 f. md. 20 frs.
2 cwt: 3 f. mds. } :: the Avoirdupois weight given: to the factory weight required.

To bring bazar maunds to Avoirdupois weight.

15 b. mds.: 11 cwt. or 1232 lbs. :: as the weight given: to the Avoirdupois weight required.

To bring Avoirdupois weight to bazar weight.

11 cwt. or 1232 lbs. : 15 mds. :: the Avoirdupois weight given: to the bazar weight required.

(1) How many pounds Avoirdupois weight are in 1078 mds. 11 frs. factory weight.

1st way. mds. cwt. mds. frs.
3 : 2 :: 1078 11
40 40
120 frs. 43131 frs.
2
12,0)8626,2
cwts. 718—102
4
12,0)40,8
qrs. 3 48

cwts. qrs. lbs.
718 3 11
4

2875 qrs.
28

23011
5750

80511 lbs. 3 oz. 3 dms. $\frac{24}{120}$

qrs. 3 48
28

384
96

12,0)134,4

lbs. 11 24
16

38,4
12,0

oz. 3 24
16

38,4
12,0

3 $\frac{24}{120}$

2d way. md. frs. : lbs. :: md. frs.
1 20 : 112 :: 1078 11
40 40

60 frs. 43131 frs.
112

86262
474441

483067,2
6,0

lbs. 80511 3 3 $\frac{12}{60}$

3d. way. md. : lbs. thirds :: mds. frs.
1 : 74 2 :: 1078 11
40 3 40

frs. 40 224 thirds. 43131 frs.

40 : 224 : : 43131
224

172524
86262
86262

966134,4
4,0

241533 24
3

lbs. 80511 3 3 $\frac{24}{120}$

Anſwer 80511lbs. 3oz. 3dms. $\frac{24}{120}$

(2) Required the Avoirdupois weight of 980 mds. 10 ſeers bazar weight? Anſwer 718 cwt. 3 qrs. 11lbs. 3oz. 3 dms.=80511lbs. 3oz. 3dms. $\frac{8}{40}$

(3) In 9 tons of iron Avoirdupois weight how many factory maunds? Anſwer 270 maunds.

(4) In 270 maunds factory weight how mach Avoirdupois weight? Anſwer 9 tons.

(5) Required the bazar weight of 100 tons of lead? Anſwer 9727 b. mds. 10 ſrs. 14 chs. $\frac{6}{11}$

(6) How many lbs. Avoirdupois weight are in 2727 mds. 10ſrs. 14chs. bazar weight? Anſwer 99 tons 19 cwt. 3qrs. 26lbs. 13oz. 5dms. $\frac{32}{96}$

C A S E IV.

To change Bengal weights into Madras, and vice verſa.

10 Pagodas weight make 1 Pollam,
40 Pollams, — — — 1 Vis.
8 Vis, — — — — 1 Maund of 25lbs. Avoirdupois wt.

20 Maunds, — — — — 1 Candy=500lbs.
8 Meaſures, of 2lbs. 10oz. each, 1 Marcal or 21lbs.
400 Marcals, — — — — 1 Garſe=8400lbs.
or 336 Madras mds.

Note. 375 Bazar maunds are equal to 1232 Madras maunds.

75 Factory maunds, = 224 Madras maunds.

R U L E.

As 375 B. mds. : 1232 M. mds. : : B. mds. given : to M. mds. required,

As 1232 M. mds. : 375 B. mds. : : M. mds. given : to B. mds. required.

As 75 F. mds : 224 M. mds. : : F. mds. given : to M. mds. required.

As 224 M. mds. : 75 F. mds. : : F. m ds. given : to F. mds required.

(1) Sent to Madras 500 bazar maunds of tamarinds. What is the weight in candies of that place?

b. mds. m. mds. b mds.
375 : 1132 : : 500
500

375)616000(1642 M. mds.
375 20——
—— can. 82 2
2410
2250
——
·1600
1500
——
·1000
750
——
250

250

```
        250
          8
      ------
   375)2000(5 vis.
       1875
      ------
        125
         40
      ------
   375)5000(13 pollams.
       375
      ------
       1250
       1125
      ------
        125
      ======
```

Anſwer 82 M. c. 2mds. 5vis. 13pol. $\frac{125}{375}$

(2) Received from my correſpondent 500 bags of chank each 2mds. 4vis. how many bazar mds. does it come to? Anſwer 380b. mds. 19ſrs. 2chs. $\frac{608}{1232}$

(3) In factory mds. 8942 20ſrs. how many Madras mds. Anſwer 26708M. mds. 2vis. 5pol. $\frac{1}{3}$

(4) In Madras candies 1335 8m. 2vis. 5pol. how many factory maunds. Anſwer 8942 f. mds. 19 ſrs. 12chs. $\frac{1472}{7163}$

(5) In 500 bags of Patcherry rice ſent to Madras each containing $2\frac{1}{4}$ bazar maunds. how many garſe are there? Anſwer 11 garſe.

CASE V.

To change Bengal weights into Bombay weights, and *vice verſa.*

15 pice — make — 1 ſeer, = oz. $15\frac{1}{5}$ Avoirdupois.
40 ſeers — 1 maund = lbs. 38 Avoirdupois.

20 maunds — 1 candy = lbs. 760 Avoirdupois.

1 Bombay maund of 38lb. Avoirdupois } = { 2,114 bazar mds.
1,965 factory mds.

RULE.

As 1 maund of the weight given
Is to its Avoirdupois weight
So is the weight given
To its Avoirdupois weight,

which being divided by the Avoirdupois weight of the maunds you would reduce them to produces the weight required.

(1) Received as per invoice 250 candies of cotton from Bombay, required the Calcutta bazar weight of it?

candies.		lbs.		lbs.
250	×	760	=	190000

lbs. lbs.
82,133)190000(2313b mds. 12ſrs. 13,44lbs. anſwer.

(2) Received from Bombay 2313b mds. 12ſrs. 14chs. how many Bombay candies muſt that have been reckoned in the invoice? Anſwer 2500 candies.

(3) Sent to Bombay 9876 f. mds. 30 ſrs. of tootanague, required the weight of that place? Anſwer 19406 mds. 31ſrs. of Bombay.

(4) My correſpondent at Bombay ſends me word that he has received 97 candies 31 ſrs. of tootanague on my account, which I invoiced to him in factory maunds: how many factory maunds there were is required? Anſwer 9876 f. mds. 30 ſrs.

(5)

(5) Sent to Bombay 500 bazar maunds of ſalt-petre, which ſtood me in four ſicca rupees per maund, and which my agent there informed me he diſpoſed of on my account at 2rs. 3qrs. 50rs. of that place per Bombay maund: required the amount ſale of the ſame, and the profit or loſs upon the whole? Anſwer 3107 Bombay rupees amount ſale, and 907 Bombay rupees profit.

REBATE OR DISCOUNT.

IS an abatement of a ſum of money due at any time to come, in conſideration of preſent payment which ſhould be as much, as being put out to intereſt would amount to the given ſum in the ſame ſpace of time.

RULE.

As 12 months
Are to the rate per cent,
So is the time propoſed
To a fourth number.

Then add that fourth number to 100 rupees, and

As that ſum
Is to the fourth number,
So is the given ſum
To the rebate.

Subſtract the rebate from the given ſum, and the remainder is the preſent worth.

Or As that ſum
Is to 100 rupees,
So is the given ſum
To the preſent payment.

Subſtract the preſent payment from the given ſum and the remainder is the rebate.

When any ſum of money is to be paid at ſeveral times, find the rebate or preſent worth of each particular payment ſeparately, and add them together.

To prove queſtions in this rule, find the amount of the preſent payment at the time and rate per cent given, and that will be equal to the given ſum.

(1) How much ready money ought I to receive for a note of 795rs. 10a. 4p. due 15 months hence, diſcounting at the rate of 9 per cent per annum?

months. per cent. months. fourth number.
12 : 9rs. : : 15 : 11rs. 4a.

fourth number. rupees. ſum.
11rs. 4a. + 100 = 111rs. 4a.

ſum. rupees. given ſum. preſent payment.
111rs. 4 : 100 : : 795rs. 10as. 4p. : : 715rs. 2a. 11p. $\frac{2040}{2136}$ anſwer.

AGAIN.

ſum. fourth number. given ſum. rebate.
111rs 4a. : 11rs. 4a : : 795rs. 10a. 4p. : 80rs. 7a 4p.

given ſum. rebate. preſent payment, anſwer.
795rs. 10a. 4p.—80rs. 7a. 4p. = 715rs. 3a.

PROOF.

PROOF.

rupees. per cent. preſent payment. int. for 1 year.

100 : 9rs. :: 715rs. 2a. 11p. : 64rs. 5a. 10p,

intereſt for 1 year. Intereſt for 3 months.

4)64rs. 5a. 10p.(165rs. 1a. p.

principal. int. for 1 year. int. for 3 months.

715rs. 2a. 11p. + 64rs. 5a. 10p. + 16rs. 1a. 5p. =

795rs. 10a. 2p. given ſum.

(2) Suppoſe 810 rupees are to be paid 3 months hence allowing 5 per cent diſcount, what will be the rebate?

months. per cent. months. fourth number.

12 : 5rs. :: 3 : 1r. 4a.

fourth number. rupees. ſum.

1r. 4a. + 100 = 101rs. 4a.

ſum. fourth number. given ſum. rebate, anſwer.

101rs. 4a. : 1r. 4a. :: 810rs. : 10rs.

AGAIN.

ſum. rupees. given ſum. preſent payment.

101rs. 4a. : 100 :: 810rs. : 800rs.

given ſum. preſent payment. rebate, anſwer.

810rs. — 800rs. = 10rs.

PROOF.

Rupees. percent. preſent payment. int. for 1 year.

100 : 5rs. :: 800 rs. : 40 rs.

4)40(10 intereſt for 3 months.

Principal. intereſt. given ſum.

800 rs. + 10 rs. = 810 rs.

(3) Suppoſe 18 months hence a bill of 987 rs. 8 a. will be due to me, how much can I receive at preſent, if I allow my debtor 10 per cent diſcount? Anſwer 858 rs. 11 a. 1 p. $\frac{104}{184}$

(4) If a legacy of 1000rs. is left me July the 24th, 1789, to be paid on the Chriſtmas day following, what muſt I receive, when I allow 6 per cent for preſent payment? Anſwer 975 rs. 9 a. 9p. $\frac{12}{184}$

(5) Being obliged by a bond bearing date Auguſt the 29th 1789, to pay next midſummer 14590 rupees, what muſt I pay down, if I am allowed diſcount after the rate of 12 per cent per annum? Anſwer 13284 rs. 6a. 3p. $\frac{10539}{21087}$

(6) Sold goods for 3120 rupees to be paid at two three months, that is half at three months, and the other half at three months after that, what muſt be diſcounted for preſent payment at 5 per cent, Anſwer 57 rs. 4a. 10p. $\frac{60}{704}$

(7) Sold goods for 3000 rupees to be paid at three two months, that is one third at two months, one third at four months, and one third at ſix months, what muſt be diſcounted for preſent payment at four per cent? Anſwer 39 rs. 6 a. 1 p. diſcount.

(8) What is the preſent worth of 1000 rupees at 5 per cent payable at two four months? Anſ 975rs. 10 a. 9 p.

(9) I would know the preſent worth of 15000 rupees payable at three four months, at 5 per cent diſcount? Anſr. 14518 rs. 10 a. 3 p.

(10) What is the preſent worth of 20,000 rupees at four per cent payable as follows, viz. 10,000

rupees at 2 months, 5000 rupees at 3 months, and 5000 rupees at 5 months? Anſr. 19302 rs. 14a. 9p.

(11) Sold goods amounting to 2170 rs. 10a. 4p. half payable at three months, and the other half at three months after, how much am I to receive, when I allow diſcount at 5 per cent per annum? Anſr. 2130 rs. 12a. 4p.

(12) What preſent money will diſcharge a debt of 1120 rs. 8a. 6p. due at 3 months diſcounting after the rate of 6 per cent? Anſr. 1103 rs. 15a. 6p. $\frac{10944}{19488}$

(13) Bought goods of P. P. ſhop-keepeer to the amount of 1000 rupees, for which I gave him a treaſury order amounting to 1500 rupees, diſcount allowed at 15 per cent I deſire to know how much he, or I ſtand indebted? Anſr. 275 rs. P. P. owes me.

(14) Sold goods to Col. C. to the amount of 750 rupees, for which I am to receive a bill on the Company's treaſury, and to be allowed a diſcount of 15 per cent. I deſire to know how much it muſt amount to? Anſr. 862 rs. 8 a.

(15) Bought of Lieutenant A. a bill on the general pay-maſter amounting to 750 rupees, what am I to pay for it, when he allows me a diſcount of 14 per cent? Anſr. 645 rupees.

(16) Bought a Company's bond amounting to 5000 rupees bearing intereſt at 8 per cent from the 1ſt of January 85 to the 1ſt of January 88, paid ready money for the ſame, after being allowed a diſ-

count of 25 per cent. The queſtion is, how much ready money was paid ſuppoſing this to be the 1ſt of July 86, and what ſhall I clear, if I receive payment, when due? Anſr. 2127 rs. 4 a. 5 p.

EQUATION OF PAYMENTS.

IS when ſeveral ſums of money to be paid at different times are reduced to one mean time for the payment of the whole, without loſs to either debtor or creditor.

RULE.

Multiply each payment by its time, and divide the ſum of all the products by the whole of the debt, the quotient is the equated time.

(1) A. owes B. 1000 rupees, whereof 500 are to be paid at 2 months, and 500 at 4 months; but they agree to reduce them to one payment, when muſt the whole be paid?

rs.		mo.		prod.
500	×	2	=	1000
500	×	4	=	2000
1,000		)		3,000

Anſwer 3 months.

(2) A merchant has owing him 30000 rupees to be paid as follows: 5000 at 2 months, 1000 at 5

months, and the reſt at 8 months, and it is agreed to make one payment of the whole: I demand when that muſt be? Anſwer 6 months.

(3) K. is indebted to L. a certain ſum, which is to be diſcharged at 4 ſeveral payments, that is $\frac{1}{4}$ at 2 months, $\frac{1}{4}$ at 4 months, $\frac{1}{4}$ at 6 months, and $\frac{1}{4}$ at 8 months; but they agreeing to make but one payment of the whole, the equated time is therefore demanded? Anſwer 5 months.

(4) H. bought of X. a quantity of goods on truſt for which, H. was to pay $\frac{1}{3}$ of the debt every 3 months, until the whole ſhould be diſcharged; but they afterwards agreed to pay the whole at one equated time; the time is demanded? Anſr. 6 months.

(5) B. owes C. 4200 rupees, which will be due 6 months hence; but B. is willing to pay him 600 rupees now, provided he can have the reſt forborn a longer time: it is agreed on: the time of forbearance is therefore required? Anſr. 7 months.

(6) L. owes me 5000 rupees payable in 4 months, and 5000 rupees payable in 6 months, and O. owes me 5000 rupees payable in 8 months, and 5000 rupees payable in 10 months: what will be the equated time for the payment of each perſon's money? Anſr. 5 months L's equated time, and 9 months O's equated time.

(7) A. owes B. 20000 rupees, whereof 5000 rupees are to be paid down, 5000 rupees at the end of 3 months, 5000 rupees at the end of 6 months, and 5000 rupees at the end of 9 months; but as

they agree to make but one payment, when will it be due? Anſwer 4 months 15 days hence.

(8) A perſon dying bequeaths to a younger ſon 10000 rupees, to be paid as follows, viz. 3000 rupees at 1 year's end, 3000 rupees more at a year and a half, and the remainder at the end of 2 years and a half. Now the executor agrees with the legatee to pay the whole at one payment; how long from the death of the father muſt this payment be, ſo that neither party be wronged or ſuffer loſs? Anſwer 1 year 9 months.

COMPANY,

OR

SINGLE FELLOWSHIP.

BY ſingle Fellowſhip is adjuſted the accompts of ſuch partners, that put all their ſeveral, and perhaps different ſums of money into one common ſtock at the ſame time, and therefore it is uſually called, the rule of Fellowſhip without time, alſo by it the eſtate of a bankrupt may be divided among his creditors: alſo legacies may be adjuſted, when there is a deficiency of aſſets, or effects.

RULE.

As the ſum of the ſeveral ſtocks,
Is to the total gain or loſs;
So is each man's ſhare in ſtock,
To his ſhare of the gain or loſs,

To prove queſtions in this rule, add all the ſhares together, and the ſum will be equal to the given gain or loſs.

(1) A. and B. were ſharers in a parcel of merchandize, in the purchaſe of which A. laid out 30 rupees and B. 70 rupees, and the commodity being ſold, they find their clear gain amount to 250 rupees: what part of it muſt each man have?

A. laid out 30 rupees.
B. laid out 70 rupees.

Both laid out 100 rs. ſum of ſtocks.

ſum of ſtocks. gain. A.'s ſtock. A.'s gain.
100rs. : 250rs. : : 30rs. : 75rs.
ſum of ſtocks. gain. B.'s ſtock. B.'s gain.
100rs. : 250rs. : : 70rs. : 175rs.

Anſwer A.'s gain 75rs.
B.'s gain 175rs.

whole gain 250 proof.

(2) A. B. and C. trading together gained 1200 rupees, which is to be ſhared according to each man's ſtock; A. put in 1400 rupees, B. put in 3000 rupees, and C. put in 1600 rupees, required each man's ſhare? Anſwer A.'s ſhare 280rs. B.'s 600rs. C.'s 320rs.

(3) Three merchants trading to Madras loſt goods to the value of 8000 rupees: now if A.'s ſtock was 12000rs. B.'s 48000rs. and C.'s 2000rs. what ſum did each merchant loſe? Anſwer A. loſt 1548rs. 6a. 2p. $\frac{20}{62}$ B. 6193rs. 8a. 9p. $\frac{18}{62}$ and C. 258rs. 1a. $\frac{2}{62}$

(4) Four men traded with a ſtock of 8000 rupees, and they gained in two years time twice as much, and 400 rupees over. A.'s ſtock was 1400 rupees, B.'s 2600, and C.'s 3000rs. I demand D.'s ſtock, and what each man gained by trading? Anſwer D's ſtock was 1000rs. and A. gained 2870rs. B. 5330rs. C, 6150rs. and D. 2050rs.

(5) A. B. and C. freight a ſhip from Madeira to Calcutta with 108 tuns of wine, of which A. ſent on board 48 tuns, B. 36, and C. 24; but by reaſon of bad weather 45 tuns were thrown over board: how much muſt each ſuſtain of the loſs? Anſwer A. muſt loſe 20 tuns, B. 15 tuns, and C. 10 tuns.

(6) A merchant is indebted to P. 700rs. to Q. 4000rs. and to R. 1400rs. 8a. but upon his deceaſe his eſtate is found to be worth no more than 4090rs. 14a. how therefore muſt it be divided among them? Anſwer P. muſt have 469rs. 6a. 5p. $\frac{96600}{97608}$ Q. 2682rs. 5a. 1p. $\frac{63960}{97608}$, and R. 939rs. 2a. 4p. $\frac{74656}{97608}$.

(7) If the money and effects of a bankrupt amount to 1400rs. 8a. 6p. and he is indebted to A. 7420rs. 12a. to B. 6410rs. 4a. and to C. 9870rs. how muſt it be divided among them? Anſwer A. muſt have 4383rs. 8a. 8p. $\frac{372474}{379216}$, B. 3786rs. 10a. $\frac{326616}{379216}$, and C. 5830rs. 5a. 8p. $\frac{59392}{379216}$.

(8) A. hath in ſtock 350rs. and B. 200rs. they trade and gain 400 rupees, and agree, that it ſhall be divided ſo, that A. is to have 10 per cent on his venture, but B. only 8 per cent; what muſt each

have of the gain? Anſwer A. will have 274rs. 8a. 1p. $\frac{45}{51}$, and B. 125rs. 7a. 10p. $\frac{6}{31}$.

(9) A. B. and C. put in money together, A. put in 200rs. B. and C. put in 850rs. they gained 630rs. of which B. took up 210rs. what did A. and C. gain, and B. and C. put in? Anſwer A's. gain was 120rs. and C's. 300rs. B. put in 350rs. and C. 500rs.

(10) Some others advance in trade as follows: W. X. and Y. raiſed 3500rs. 10a., W. X. and Z. 3448rs. 10a. X. Y. and Z. made up together 3780rs. 4a. and W. Y. and Z. contributed 4000rs. in the concluſion they parted with their joint property for 4500rs. what did they gain or loſe by the adventure? Anſwer 410rs. 2a. 8p. loſs.

(11) A. B. and C. put in trade 3600rs. and gained 2700rs. of which as often as A. took up 30rs. B. took up 50rs. and as often as B. took up 50rs. C. took up 70rs. what did each put in and gain? Anſwer A. put in 720rs. and gained 540rs. B. put in 1200rs. and gained 900rs. and C. put in 1680rs. and gained 1260rs.

(12) A. B. and C. put in money together, A. put in 200rs. B. 300rs. and C. a ſum unknown; they gained 360rs. whereof C. took 160rs. what did A. and B. gain, and C. put in? A. gained 80rs. B. gained 120rs. and C. put in 400rs.

(13) A. B. C. and D. put in money together, and gained a ſum, of which A. B. and C. took 600rs. B. C. and D took 900rs. A. C. and D. took 800rs. and A. B. and D. took up 700rs. What

diſtinct gain did each take up? Anſwer A. took up 100rs. B. 200rs. C. 300rs. and D. 400rs.

(14) A. and B. cleared by an adventure at ſea 500 rs: with which they agreed to buy a horſe and buggy; whereof they were to have the uſe in proportion to the ſums adventured, which was found to be A. 10 to B. 7; they cleared 45 per cent, what money did they ſend abroad? Anſr. A. ſent 653rs. 9a. 6p. and B. 457rs. 8a. 3p.

(15) Three merchants having gained in partnerſhip 36000rs. hence ariſes the queſtion to know what was each merchant's ſhare of the profit, and what was his ſtock ſeparately, knowing only that the ſtock and profit of the firſt together is 57600rs. of the ſecond 72000rs. and of the third 86400rs.

Anſr. { 1ſt. merchant's ſtock 48000rs. and profit 9600rs.
2d.————————60000rs.—————12000rs.
3d.————————72000rs.—————14400rs.

(16) Three ground renters pay among them 400rs. for a ſpot of ground, into which they ſow 3000 maunds of paddy, whereof A. had 800mds. B. 1000mds. C. 1200mds, how much had each to pay. Anſwer A. had to pay 106rs. 10a. 8p. B. 133rs. 5a. 4p. and C. 160rs.

(17) Divide 1000rs. ſo that A. may have $\frac{1}{2}$ B. $\frac{1}{3}$, C. $\frac{1}{4}$ and tell me each man's quota? Anſwer A's quota is 461rs. 8a. 7p. $\frac{5}{13}$ B's. 307rs. 11a. $\frac{1}{13}$ and C's. 230rs. 12a. 3p. $\frac{9}{13}$

(18) A bankrupt's Money and effects amount to 8110rs. 10a. and he owes as follows: to Mr. Cruel 2200rs. 8a. 3p. Mr. Gripe 3120rs. Mr. Hard 117crs. 6a. 3p. Mr. Covet 1060rs. 6a. 3p. Mr. Near 2000rs. 6a. and Mr. Squeeze 1240rs. 6a. 6p. what is each perſon's

proportion of the bankrupt's preſent property? Anſwer Mr. Cruel's porprortion of it is 1653rs. 12a. 2p. $\frac{1674522}{2072075}$. Mr. Gripe's 2344rs. 12a. 7p. $\frac{1155879}{2072075}$. Mr. Hard's 879rs. 9a. 5p. $\frac{413001}{2072075}$. Mr. Covet's 796rs. 14a. 8p. $\frac{1614168}{2072075}$. Mr. Near's 1503rs. 5a. 7p. $\frac{182483}{2072075}$. Mr. Squeeze's 932rs. 3a. 4p. $\frac{174184}{2072075}$.

COMPANY with TIME,

O R

DOUBLE FELLOWSHIP.

COMPOUND Fellowſhip is when the ſtocks continue an unequal term of time.

RULE.

1ſt. Multiply each man's ſtock and time together.
2dly. Add the ſeveral products thence ariſing togother.
3dly. As the ſum of thoſe products
Is to the whole gain or loſs;
So is each product
To its ſhare of the gain or loſs.

Theſe queſtions are proved as in Single Fellowſhip.

(1) Three merchants traded together: A. put in 1200rs. for 9 months, B. 1000rs. for 16 months, and C. 1000 for 14 months, and they gained 1000 rupeés, how muſt it be divided?

rupees.

	rupees.		months.		products.
A's. ſtock	1200	×	9	=	10800
B's. ſtock	1000	×	16	=	16000
C's. ſtock	1000	×	14	=	14000
			Sum of products		40800

ſum prod. w. gain. A.'s prod. A.'s ſhare.
40800rs: 1000rs :: 10800rs: 264rs. 11a. 3p. $\frac{208}{408}$
ſum prod. w. gain. A.'s prod. A.'s ſhare.
40800rs: 1000 :: 1600rs: 392rs. 2a. 6p. $\frac{48}{408}$.
ſum prod. w. gain. C.'s prod. C.'s ſhare.
40800rs: 1000 :: 14000rs: 343rs. 2a. 2p. $\frac{144}{408}$.

(2) Three merchants join in trade: A. put in 4000rs. for 9 months, B. 6800rs. for 5 months, and C. 1200rs. for 12 months, but by misfortune they loſt goods to the value of 5000rs: what muſt each man ſuſtain of the loſs? Anſwer A. muſt loſe 2132rs. 11a. 2p. $\frac{568}{844}$, B. 2014rs. 3a. 5p. $\frac{724}{844}$, and C. 853rs. 1a. 3p. $\frac{396}{844}$.

(3) A. B. and C. hold a godown in common, for which they pay 20rs. per month. In this godown A. had 400 maunds of rice for 76 days, B. had 360 maunds for 50 days, and C. had 500 maunds for 90 days: I demand what part every of theſe tenants ought to pay of the 20 rupees? Anſwer A. muſt pay 6rs. 8a 1p. $\frac{794}{934}$, B. 3rs. 13a. 8p. $\frac{40}{934}$ and C. 9rs. 10a. 2p $\frac{100}{934}$.

(4) A. and B. enter in company: A. put into ſtock 1200rs. for 7 months, and B. put in 2300rs. for 10 months, and in trading they gain 1000rs. what is

each man's ſhare in proportion to his ſtock, and time? Anſwer A.'s ſhare 267rs. 8a. 3p. $\frac{18}{314}$, and B.'s 732rs. 7a. 8p. $\frac{296}{314}$.

(5) Three perſons enter into partnerſhip, viz. A. B. and C. A. puts into ſtock 650rs. for 8 months, B. 780rs. for 12 months, and C. 840rs. for 6 months, and they gain 1660 rupees; what is each man's ſhare? Anſwer A.'s ſhare is 440rs. 6a. 6p. $\frac{72}{196}$ B.'s 792rs. 11a. 9p. $\frac{12}{196}$, and C.'s 426rs. 13a. 8p. $\frac{112}{196}$.

(6) Three merchants accompany for ſome time; A. puts in 4870rs. 10a. 6p. for 4 months, B. puts in 9470rs. 8a. for 6 months, C. puts in 7970rs. 12a. for 8 months; and they gained 97480rs. 12a. I would know each man's ſhare of this gain? Anſwer A.'s ſhare is 13558rs. 10a. 3p. $\frac{220674}{2241146}$, B.'s 39545rs. 1a. 10p. $\frac{604470}{2241146}$, and C.'s 44376rs. 15a. 10p. $\frac{1416052}{2241146}$.

(7) A. B. and C. commence a partnerſhip the 1ſt of January for a year, A. the ſame day pays in his ſtock of 1000rs, and withdraws again the 1ſt of April 200rs. B. pays in on the 1ſt of March 600rs. and on the 1ſt of Auguſt 1000rs. more: C. pays to the ſtock the 1ſt of July 1400rs. and the 1ſt of October withdraws 400rs. at the year's end the clear gain is 1420rs. Query? What is each perſon's ſhare of that gain? Anſwer A's. gain is 510rs. B's. 550rs .and C's. 360rs. $\frac{8}{284}$

(8) Three perſons A. B. and C. entered into partnerſhip thus: A. put in 500rs. for 6 months, B. put in 700rs. for 10 months, and C. put in 900rs. for 8 months, with this they traffick, and gain 1660

1660rs. 12a. 9p. I demand each man's ſhare of the gain in proportion to his ſtock and time of employing it? Anſwer A.'s ſhare 289rs. 10a. 9p. $\frac{66}{172}$, B. 675rs. 14a. 5p. $\frac{154}{172}$, and C. 695rs. 3a. 5p. $\frac{124}{172}$.

(9) Three men joined their ſtocks together, and purchaſed a quantity of rice, which they ſent to Madras; the profit of the voyage amounted to 25000 rupees, but as the co-partners did not put in equal ſtocks, ſo the profits could not be ſhared equally; the firſt partner put in 20,000rs. for 6 months, the ſecond put in 25,000rs. for 8 months. and the third put in 15,000rs. for 10 months: now I deſire to know, what ſum each partner will receive? Anſwer the firſt will receive 6382rs. 15a. 7p. $\frac{43}{47}$, the ſecond 10638rs. 4a. 9p. $\frac{9}{47}$. and the third 7978rs. 11a. 6p. $\frac{42}{47}$.

BARTER.

WHEN merchants &c. exchange one commodity for another, it is called bartering, the price and quantity of the goods, ſo exchanged are then determined, ſo that neither party ſhall ſuſtain a loſs by ſuch traffick.

RULE

Firſt calculate the price of thoſe goods, of which the quantity is given, which amount muſt be divided by the other quantity, if any given, to find their price, or by the price of the other goods, when given, to find their quantity.

(1) A and B. bartered A. had 120 maunds of cloves worth 6rs. 4a. per ſeer, for which B. gave him 85 maunds of cinnamon: I demand how B. rated his cinnamon per ſeer?

120 mds. each 40ſrs. at 6rs. 4a. per maund=30000rs. the value of the cloves, then

mds.	rupees.	ſeer.	Anſwer.
85 :	30000 : :	1 :	8rs. 13a. 2p. $\frac{4}{17}$ being

the value of one ſeer of cinnamon in barter.

(2) A. and B. bartered; A. had 60 maunds of ghee at 12 rupees per maund: for which B. gave him 200 rupees in money, and the reſt in dates at 20 rupees per maund. I demand how many dates B. gave A. beſides the 200 rupees? Anſwer 26 maunds.

(3) C. has candles at 2 rupees per dozen ready money; but in barter he will have 2rs. 2a. D. has cotton at 14 rupees per maund ready money; I demand what price the cotton muſt be at in barter? alſo how much cotton muſt be bartered for 100 dozens of candles? Anſwer 14mds. 11ſrs. 6chs. $\frac{204}{238}$ at 14rs. 14a. per maund.

(4) How many tubs of China ſugar muſt be bartered for 10 $\frac{1}{4}$ cheſts of tea each 95 rupees, when the ſugar is worth no more than 14 rupees per tub? Anſwer 69 tubs and 7rs. 12a. over.

(5) A merchant barters 10 pieces of drugget each 25 yards at 1r. 9a. per guz, againſt pepper at 23rs. 8a. per maund. The queſtion is how many maunds of pepper muſt he receive? Anſwer 16mds. 24ſrs. 14chs. $\frac{112}{176}$

(6)

(6) A merchant has 1000 guz of canvas at 6 annas per yard, which he barters for dungaree at 1½ annas per cubit, how many yards muſt he receive? Anſwer 2000 yards.

(7) A. has ſilk at 5 annas per ſeer, B. has cloth at 10 rupees the yard, which he barters at 12 rupees per yard, at how much muſt A. put his ſilk to make his profit equal with B. Anſwer 6a. per yard.

(8) B. has 100 corge of muggirdooties worth 27rs. 8a. per corge, which he barters with C. thus: to have 1000 rupees in money, and the reſt in ſannas at 18 rupees each piece, how many pieces ſhould he recieve? Anſwer 97 pieces and 4 rupees over.

(9) A. has coffee which he barters with B. at 3 annas per ſeer more than it coſt him againſt tea, which ſtands B. in 5rs. per ſeer, but put it to 5rs. 8a. I would know how much the coffee coſt at firſt. Anſwer 1r. 14a.

(10) Bartered 100 pieces of long cloth at 75 rupees per piece againſt ſhawl handkerchiefs at 80 rupees per pair; how many handkerchiefs am I to receive? Anſwer 187 handerchiefs, and 20 pieces over.

(11) Suppoſe A. has a quantity of coſſars at 18 rupees per piece, which he would truck with B. for 50 pieces of muſlin at 50 rupees each, and 130 pieces of chintz at 8 rupees each, how many pieces of coſſars muſt he return? Anſwer 196 pieces and 12rs. over.

(12) A. has 5 bales of pepper weight neat 40 maunds at 22rs. 12a. per maund, which he barters with B. for two ſorts of goods, the one at 8 annas and the other at 5 annas per ſeer, to have a third in money,

and of each ſort of goods an equal quantity, I demand how many ſeers of each ſort of goods he is to receive, and how much money? Anſwer 303rs. 5a. 4p. and 746ſrs. 10chs. $\frac{104}{156}$ of each ſort.

(13) A. has broad cloths each 25 yards at 5rs. 8a. per yard, and B. has ſalt-petre at 5rs. per maund, how many maunds of ſalt-petre muſt be given for 24 broad cloths? Anſwer 660 maunds of ſalt-petre.

(14) B. has 5000 ſheathing boards at 23 rupees per corge, and C. has 200 timbers at 18 rupees per piece, which they agree to give to D. for a quantity of beetlenut at 7 rupees per maund; how much muſt each perſon receive for his ſhare? Anſwer B. muſt have 821mds. 17ſrs. 2chs.$\frac{2}{7}$ and C. 514mds. 11ſrs. 6chs. $\frac{6}{7}$.

(15) A. has 120 maunds of tootanague at 16 rnpees per maund which he is willing to barter with C. for a quantity of iron at 8 rupees per maund, how many maunds ſhould A. receive if C. agrees to the propoſal? Anſwer 240 maunds.

(16) D. and C. bartered thus, D. gave 120mds. 10ſrs. of ſugar. value 7rs. 4a. per maund to C. for 15$\frac{1}{2}$ maunds of cinnamon, what was the cinnamon rated at per maund? Anſwer 56rs. 3a. 11p. $\frac{7}{31}$.

(17) A. and B. bartered; A. has 86 gallons of brandy worth 3rs. 4a. per gallon ready money, but in barter he will have 3rs. 8a. per gallon, and B. has caſſimeer worth 5 rupees per yard ready money: Query, How many yards of caſſimeer muſt B. give A. for his 86 gallons of brandy, and what is the price of the caſſimeer in barter? Anſwer 55yds.

3qrs. $\frac{809}{1033}$, muſt be given in barter, and 5rs. 6a. 1p. is the price of the caſſimeer in barter.

(18) Two merchants, A. and B. bartered, A would exchange 20 maunds of nutmegs at 84 rupees per maund for 18 pieces of Madras cloth at 80 rupees per piece; I demand who ſtands debtor; and how much? Anſwer B. owes A. 240 rupees.

(19) A. and B. bartered. A. has 1000 yards of broad cloth at 9 rupees per yard; but in barter he will have 10rs. 8a. and will alſo have a quarter of the barter value in ready money; and B. has ſalt at 2rs. 2a. per maund; how much ſalt ought B to deliver, and how is it to be raiſed to equal the barter price of the broad cloth? Anſwer 3176mds. 18ſrs. 13chs. $\frac{84}{476}$ at 2rs. 7a. 8p. per maund.

(20) A. has 40 cloths at 95 rupees per piece ready money. In barter they are charged by him at 100 rupees per piece, but half of that is required in caſh. B. has flax at 3 ſeers per 1 rupee; how ought he to rate it in truck not to be hurt by the extortion of A. and how much flax muſt he give him? Anſwer 142 mds 22ſrs. 15chs. $\frac{106}{201}$ at 1r. 0a. 10p. per maund.

LOSS AND GAIN

IS the rule by which we find, what is gained or loſt by the ſale of any commodities, having the price known, and regulating the ſale of them, ſo that we may not injure our cuſtomers by being exorbitant, or ourſelves by fixing the price too low.

RULE

RULE.

Calculate the coſt and ſale, and the difference between them will give the loſs or gain.

(1) Bought 12 pieces of white cloth for 20 rupees per piece, paid 5 rupees a piece for dying: for how much muſt I ſell them a piece to gain 20 per cent, and what is the amount coſt and ſale of the whole?

12rs. × 20rs. = 240rs. firſt coſt.
12rs. × 5rs. = 60rs. charges on dying.
240rs. + 60rs. = 300rs. amount coſt.
100rs. : 10rs. : : 300rs. : 360rs. amount ſale.
12)360(30rs. ſelling price of one piece.

(2) Suppoſe I buy 28 pieces of goods at 72rs. per piece, and ſell 10 pieces at 80rs. and 8 at 90rs. at what rate muſt I ſell the reſt to gain 10 per cent by the whole? Anſwer 69rs. 12a. 1p.$\frac{9}{10}$ per piece.

(3) Having ſold a yard of cloth for 10rs. 8a. I gained at the rate of 15 per cent; but if I had ſold it for 12rs. what ſhould I have then gained per cent? Anſwer 17$\frac{1}{8}$ per cent.

(4) Bought 14 pipes of wine at 432rs. per pipe, which I ſell immediately after for 472rs. what is the whole gain, and how much per cent? Anſwer 560rs. whole gain, and 9$\frac{1}{4}$ gain per cent.

(5) Bought a tun of wine for 800rs. ready money, ſold it for 900rs. payable in 8 months time. I demand how much per cent per annum I ſhall clear? Anſwer 18$\frac{3}{4}$ per cent.

(6) Having bought a parcel of goods for 1000rs. and ſold the ſame immediately for 1120rs. with 4 months credit, what is gained per cent per annum? Anſwer 36 per cent per annum.

(7) Bought 40 gallons of Brandy at 3rs. per gallon; by accident 6 gallons of it were loſt, at what rate may I ſell the reſt with 8 months credit, and gain upon the whole prime coſt at the rate of 10 per cent per annum? Anſwer 3rs. 12a. 2p.$\frac{28}{34}$ per gallon.

(8) Bought 100 ſkins of raiſins at 2 rupees each payable in 9 months; ſold them for 2rs. 4a. payable in 15 months; what is the profit per cent per annum at that rate? Anſwer 25 per cent.

(9) Suppoſe I have goods to the value of 5796rs. 10a. 6p. that come to a bad market, and know that they impair by lying, I therefore am obliged to ſell them at 12 per cent loſs; what come they to? Anſwer 5111s. 1a amount ſale.

(10) A man buys cotton for 6rs. a maund, which not proving ſo good as was expected, would put it off again, ſo as but to loſe 6 per cent by it, what is the ſelling price? Anſwer 5rs. 10a. 3p. ſelling price.

(11) A man buys 2000 bazar maunds of pepper, with which he went to Madras, it coſt him 3ſ.rs. 4a per bazar maund, the freight and cuſtom came to 150ſ rs. his own expences and charges were 216ſ.rs. 13a. 4p. for how much muſt he ſell it per Madras maund in Arcot rupees to gain 20 per cent? Anſwer 1 A. r. 5a. 6p. per Madras maund.

(12) If my factor at Madras returns me 800 barrels of anchovies each weighing 14 ſeers, which ſtand me here in $12\frac{1}{2}$ annas per ſeer, in lieu of 7490 ſeers of ſalt-petre, and I find that I have gained after the rate of 17 per cent by the ſaid conſignment: pray how was my ſaid ſalt-petre invoiced per ſeer to the factor, that is, what was the prime coſt? Anſwer 1 rupee per ſeer nearly.

(13) Having bought 160 gallons of French brandy at 2rs. 8a per gallon, there chanced to leak out 18 gallons; at what rate per gallon may I ſell the remainder with 8 months credit, ſo as to gain upon the whole prime coſt at the rate of 12 per cent per annum? Anſwer 3rs. 0a. 8p. $\frac{16}{142}$ per gallon.

(14) Having paid 14a. a yard for 100 yards of cloth, I propoſe to gain 25 per cent ready money, and if I ſell it upon time to have moreover 10 per cent per annum on the ready money price for the forbearance, what muſt be the price of one yard with 6 months credit to make both theſe gains? Anſwer 1r. 1a. 6p. ready money price, and 1r. 2a. 4p. $\frac{1}{2}$ on 6 months credit.

(15) Laid out in a lot of muſlin 480rs. 12a. upon examination of which 2 parts in 7 proved damaged, ſo that I could make but 5a. 6p a yard of the ſame, and by ſo doing find I loſt 48rs 10a. by it, at what rate per yard am I to part with the undamaged muſlin to make up my ſaid loſs? Anſwer 9rs. 8a. per yard.

(16) A draper bought 100 yards of long cloth, for which he gave 560 rupees, I deſire to know how he muſt ſell it per yard to gain 190 rupees on the whole? Anſwer 7rs. 8a. per yard.

(17) A vintner buys a quantity of brandy at 2rs. 8a. per gallon payable at 6 months, and ſells the ſame at 3 rupees per gallon payable in 10 months: how much per cent does he gain at that rate per annum? Anſwer 60 per cent.

(18) A merchant buys 10 caſes of ſago weight 40 mds. 13ſrs. at 6rs. 2a. per maund payable in 3 months, ſells it for 4 annas a ſeer payable in 7 months. Tell me how much per cent per annum is gained at that rate? Anſwer 189rs. 12a. 11p. $\frac{37188}{159684}$ per cent.

(19) A merchant receives from Buſſorah 180 caſks of raiſins, which ſtand him here in 16 rupees each, trucks them againſt other merchandizes at 28rs. per maund, by which he gained 25 per cent profit. I demand the weight of each caſk one with another? Anſwer 28ſrs. 9chs. $\frac{98}{430}$ each caſk.

(20) A merchant ſends to Madras 500 pieces of chintz at 18rs. 8a each, pays for duty and other charges 109rs. 10a. 8p. his correſpondent at Madras ſells the chintz at 6 and a half pagodas per piece, pays for freight, &c. 50 Arcot rupees and takes 5 per cent for his commiſſion; I demand the loſs or gain, when 100 pagodas are worth 345 Arcot rupees? Anſwer 508rs. 11a. 5p. $\frac{76}{118}$ profit.

IMPORTS

IMPORTS and EXPORTS.

IN caſting up the amount of goods bought, imported, or exported: to the prime coſt of ſuch goods, we muſt add all the charges upon them, in order to fix the price they ſtand us in, as will appear from the following.

(1) Suppoſe I import from Madras 5 bales of paper, each bale 10 reams, which with charges there amounted to 820 rupees, I pay duty here 6 annas per ream, and for freight 40 rupees: what does this paper ſtand me in per ream, and how muſt I ſell it per ream to gain 10 per cent?

Firſt coſt of the paper — —	820rs.
Duty on 50 reams, each 6a —	18rs. 12a.
Freight — — — —	40rs.
Amount coſt — — —	878rs. 12a.
10 per cent profit — — —	87rs. 14a.
Amount ſale — — —	966rs. 10a.

50)966rs. 10a. (19rs 5a. 4p. each ream muſt be ſold for. Anſwer.

(2) Suppoſe a bale of merchandize weighed 7mds. 20 ſrs. and coſt me 304 rupees, I pay for duty 2 annas per ſeer: for freight 14 rupees: and for coolies home 12 annas: how much will 1 ſeer of the merchandize ſtand me in? Anſwer 1r. 3a. per ſeer.

(3) Imported 4 pipes of linſeed oil containing 480 gallons, which coſt 4rs. 1a. per gallon paid for freight 4 rupees per pipe, duty 2 annas per gallon, cooley hire 1½r.

$1\frac{1}{2}$ r. per pipe: what muſt I ſell it for per gallon to gain 12 per cent? Anſwer 5rs. 3a. 7p. ſelling price per gallon.

(4) Bought 150 caſks of porter each 32 gallons for 84 rupees per caſk, paid cuſtom 5a. per caſk, cooley hire 2 annas per caſk; the godown rent came to 30 rupees; cooperage 37rs. 4a. When I ſell them for 15000 rupees, what do I gain upon the whole, per caſk, and per cent? Anſwer 2267rs. 2a. gain upon the whole, 15rs. 1a. 9p. $\frac{138}{150}$ gain per caſk and $17\frac{13}{16}$ per cent nearly.

(5) Bought 200 carcaſſes of beef,. weight neat 474 mds. 10ſrs. 8chs. at 3rs. 8a. per maund, and ſalted them up in 400 barrels, which coſt 3rs. 4a. a piece, paid for 50 mds. of ſalt, at 4rs. 12a. per maund, paid for ſalting, coolies, &c. 25 rupees, now I want to know, what one barrel ſtands me in? Anſwer 8rs. 1a. 1p. $\frac{64}{400}$ per barrel.

(6) Shipped for Madras 1200 bags of rice, which coſt me 2rs. 8a per bag; paid for 1200 gunny bags at 2 annas each; for packing 3 pice per bag; cooley hire to the cuſtom houſe gaut 6 pice per bag, for licenſe, duty, and other port charges 210rs. 8a. 6p. boat hire 11 rupees: I deſire to know what it ſtands me in per bag on board? Anſwer 2rs. 13a. 8p. $\frac{4}{1200}$ per bag

(7) Imported from Madras 20 pipes of wine at 180 rupees per hogſhead, paid duty here 1 anna per gallon, freight 25 rupees per tun, the charges for boat and cooley hire came to 18rs. 8a. A ſtorm ariſing, 1 pipe containing 126 gallons was thrown over board: What does the remainder ſtand me in

gallon, how muſt I ſell it per hogſhead to gain 10 per cent, and what do I gain by the whole at that rate? Anſwer 3rs. 2a. 11p. prime coſt per gallon, 220rs. 12a. ſelling price per hogſhead, and 762rs. 9a. 7p. whole gain.

(8) Shipped on board the ſnow Admiral Hughes 20 bales muggerdooties, each 5 corge, each 32rs. 8a. paid charges as follows: godown rent for 1 month previous to the embarkation 30 rupees; paid for 10 pieces dungaree each 2 rupees; packing ditto 4 annas per bale; cuſtom 4 rupees per corge; boat and cooley hire 20 rupees. What come they to per corge? Anſwer 37rs. 4a. per corge.

Purchaſed 300 maunds of long pepper at 3 rupees per maund, packed them in bags each 3 maunds; paid for bags 2 annas each; packing ditto 3 pice each; godown rent came to 10 rupees; exported the whole to Madras; paid cuſtoms 8 annas per bag, cooley hire 6 pice per bag, and boat hire 5 rupees: how muſt I charge them per bag to gain 30 per cent upon the whole? Anſwer 12rs. 12a. 3p. $\frac{54}{100}$ ſelling price per bag.

INVOICES.

INVOICE of 1000 bags of rice ſhipped by me A, B on board the Madras Trader, John Dolbins maſter, and conſigned to Thomas Gunſton, merchant at Madras, for account and riſk of ſelf, of Calcutta, being marked and numbered as per margin contents to ſtand charges, viz.

		rs.	a.	p.
	1000 bags of rice each 2 maunds at 1r. 10a. per maund . . .	3250	—	—
	2000 gunny bags being doubled at 14rs. 8a. per 100	290	—	—
No. 1.	To cuſtom of ditto .	50	—	—
to 1000,	To packers packing ditto	20	—	—
marked	To twine	6	—	—
T. G.	To cooley hire . .	10	—	—
	To boat hire	5	—	—
	To my commiſſion at 2¼ per cent on the above being 3631rs. . . .	99	13	6
	Rs.	3730	13	6

Errors excepted.

Calcutta 1ſt September 1788.
Per A: B:

What ſum may I draw for on S. Gunſton, of Madras, in pagodas exchange at 3rs. 12a. per ſtar pagoda?

3rs. 12a. : 1 pag. : : 3730rs. 13a. 6p. : Anſwer 994 ſt. pag. 40 f. 10 caſh.

Invoice of wine laden by George Hudſon on board the Santa Maria, Don Miguel maſter, for riſk, and account of Self and Co. and conſigned to Patrick Loftus and Co. in Calcutta.

To

		mil reas.
PL	To coſt of 10 pipes of Madeira wine bought of Anthony de Minas at 16 mil reas per pipe	
	To cuſtom at 1055 reas per pipe	
	To trimming, &c. at 400 reas per pipe	
No. 1 to 10.	To primage at 60 reas per pipe	
	To commiſſion at $3\frac{1}{2}$ per cent on the above . . .	
	To port charges of the ſaid ſhip	6 380
	Mil reas	

Errors excepted.

Madeira 21ſt March 1789.
Per Company and ſelf George Hudſon.

What ſum muſt Patrick Loftus and Co. anſwer for that in ſicca rupees exchange at 1000 mil reas for 5ſ. 8d. ſterling, and the current rupee valued at 2ſ. 3d. ſterling? Anſwer 407rs. 6a. 5p. exchange for 187,660 mil reas.

Invoice of 2 bales of chintz, laden by me John Connell on board the Betſey, Captain Humberſtone, for the proper riſk and account of William Graham, merchant in Calcutta, marked as per margin, contents coſt and charges, and conſigned to John King of Bombay as per order.

	To 50 pieces of chintz each 16rs. 8a.			
	To 50 pieces of chintz each 18rs. 12a. . . .			
IK	To folding and packing ditto	10	—	—
No. 1 & 2.	To dungaree and twine . .	10	—	—
	To godown rent . .	8	—	—
	To cooley and boat hire . .	3	—	—
	To cuſtom at 4 per cent on the coſt of the chintz . .			
	To my commiſſion at 2½ per cent on the above . . .			
	C. rs.			

Errors excepted.

Maſulipatam 20th Auguſt 1789.

Per John Connell.

How many Bombay rupees at 10 per cent better than current, muſt John King anſwer for William Graham in Bombay? Anſwer 2014 rs. 13 a. 0 p. $\frac{2}{11}$ of Bombay.

Invoice of 6 dubbers of ghee ſent to Calcutta by me Alexander Roſewell, in a panſhway belonging to Ramdon mangee, conſigned to William Smith merchant.

No. 1 & 2 — each weight 6mds. — Tare 10ſrs. per dubber.

No. 3 & 4 — each weight 5mds. 20ſrs. — Tare 12½ſrs. per dubber.

No. 5 & 6 — each weight 4mds. 30ſrs. — Tare 11ſrs. per dubber.

An

	At 9A. rs. 8a. per maund	rs.	a.	p.
	Dubbers	9		
	Cooley hire	4		
WS	Panſhway hire to Calcutta .	14		
	Hircarrah's wages	4		
	Cuſtoms, Tolley's creek duties and rowannah	36		
	Arcot rupees			

Errors excepted in Patna.

4th June 1789.

Per Alexander Roſewell.

What does the coſt and charges amount to upon arrival, in ſicca rupees?

Anſwer 331ſ.rs. 7a. 2p. $\frac{8}{117}$.

ALLIGATION.

ALLIGATION is when corn, wine, ſpices, metals, &c. are required to be mixed together, the method of proportioning ſuch mixture is called the Rule of Alligation.

ALLIGATION MEDIAL.

Alligation Medial is when the quantities, and prices of ſeveral things are given to find the mean price of the mixtures compounded of thoſe things.

RULE.

Firſt find the ſum of the quantities propoſed to be mixed, and alſo the ſum of their particular rates, then

As the whole compoſition
Is to its total value;
So is any part of the compoſition
To its mean price.

Alligation-Medial is proved by finding the value of the whole mixture at the mean rate, and if it agrees with the total value of the ſeveral quantities at their reſpective rates, the work is right.

(1) A grocer mingled 12 maunds of ſugar at 6 rupees per maund, 11 maunds at 4 rupees per maund, and 12 maunds at 5 rupees per maund together, I demand the price of three maunds of this mixture?

	mds.		rs.		rs.
	12	×	6	=	72
	11	×	4	=	44
	12	×	5	=	60
mds.	35				rs. 176

35mds. : 176rs. : : 3mds. : 15rs 1a. 4p.$\frac{16}{35}$ Anſwer.

PROOF.

15rs. 1a. 4p.$\frac{16}{35}$: 3mds. : : 176rs. : 35mds.

(2) A punch wallah mixed three ſorts of arrack together, viz. 12 gallons at 6 annas per gallon, 16 gallons at 7 annas per gallon, and 21 gallons at 9 annas per gallon; I demand what 1 gallon of this mixture is worth? Anſwer 7a 7p. $\frac{17}{49}$.

(3) A refiner having 5lbs. of ſilver bullion of 8 ounces fine, 10lbs. of 7 ounces fine, and 15lbs. of 6 ounces fine, would melt all together: I demand what fineneſs 1lb. of this maſs ſhall be? Anſwer 6 oz. 13dwts. 8grs.

(4)

(4) A mint maſter has 3lbs. of gold of 22 carats fine, and 3lbs. of 20 carats fine: I demand what fineneſs an ounce of this mixture will bear? Anſwer 21 carats fine.

(5) An hoſtler mixing provender for his horſes, would put in a quantity of beans at 5 rupees per maund with the like quantity of gram at 3rs. 6a. per maund: I demand the price of a maund of this mixture? Anſwer 4rs. 3a.

(6) A tea-vender hath ſeveral ſorts of tea, viz. one ſort at 4rs. 6a. another at 4 rupees, and another at 3rs. 6a. per ſeer, and he would mix an equal quantity of each of theſe together, I demand the price of a ſeer of this mixture? Anſwer 3rs. 14a. 8p.

(7) A merchant had ſeveral ſorts of indigo, viz. one ſort at 20 rupees per maund, another at 25 rupees, a third at 30 rupees, and a fourth at 35 rupees per maund, and he would mix an equal quantity of each together, I demand the price of a maund of this mixture? Anſwer 27rs. 8a.

(8) Having mixed three ſorts of cotton together, viz. 20 maunds of a ſuperior quality being at 15 rupees per maund, 50 maunds at 12 rupees per maund, and of the third quality I put in 30 maunds which ſold for 9 rupees only per maund, I demand what a maund of this mixture is now worth? Anſwer 11rs. 11a. 2p. $\frac{40}{100}$.

ALLIGATION ALTERNATE.

ALLIGATION Alternate is when the particular rate of every ingredient, and the mean rate are given to diſcover the particular quantity of each ingredient concerned in a mixture.

RULE.

The rates being all of, or reduced to one denomination, ſet the rates of the ſimples in a column under one another, and the mean rate in the center on the left hand of theſe. Then link together the ſeveral ſimple rates, ſo that one greater than the mean rate may be coupled to another which is leſs: When one branch is linked to two or more other branches, the differences ought to be as often tranſcribed as it is ſo diverſly linked. Take the differences between each price, and the mean rate, and ſet them alternately, and they will be the quantities required.

When the ſimple rates do not exceed three, there can be but one way of linking; but when they exceed three, there are ſeveral ways, and every way brings different anſwers: alſo any proportional numbers to the anſwer found by this rule will likewiſe be the anſwer to the queſtion? These queſtions are all proved by Alligation Medial.

(1) How much raiſins at 7 annas per ſeer, and at 4 annas per ſeer may be mixed together for 6 annas per ſeer.

$$\begin{array}{llcl} & \text{a.} & & \text{ſrs.} \\ \text{mean price } 6 & \begin{cases} 7 \\ 4 \end{cases} & \Big] & \begin{matrix} 2 \\ 1 \end{matrix} \end{array}$$

Anſwer 2 ſeers of 7 annas and 1 ſeer of 4 annas.

PROOF.

$$\begin{array}{ccrcl} \text{ſrs.} & & \text{as.} & & \\ 2 & \times & 7 & = & 14 \\ 1 & \times & 4 & = & 4 \\ \hline 3 &) & & & 18 \\ \end{array}$$

6 annas per ſeer
= as required.

(2) How much rice at 4 rupees per maund, at 3 rupees per maund, and at 2 rupees per maund will make a mixture worth 2rs. 8a. per maund? Anſwer 8 maunds of 4 rupees, 8 maunds of 3 rupees, and 32 maunds of 2 rupees.

(3) A man would mix four ſorts of tea together, viz. one ſort at 4 rupees per ſeer, another at 3rs. 8a. a third at 3 rupees, and a fourth at 2 rupees per ſeer, and he is deſirous to mix ſo much of each ſort together, that the whole may be ſold at 2rs. 8a. per ſeer: I demand, how much he muſt take of each ſort? Anſwer 8 ſeers of 4 rupees, 8 ſeers of 3rs. 8a. 8 ſeers of 3 rupees, and 48 ſeers of 2 rupees per ſeer.

(4) Gram at 4 rupees per maund, at 3rs. 8a. at 2rs 8a. and at 2 rupees per maund; how much of each ſort will make a compoſition worth 3 rupees per maund? Anſwer 16mds. at 4 rupees. 8mds. at 3rs. 8a. 8mds. at 2rs. 8a. and 16mds. at 2 rupees.

(5) A merchant would mix wine at 14, 19, 15 and 22 rupees per dozen, ſo as that the mixture may be worth 18 rupees per dozen,.what quantity of each muſt be taken? Anſwer 4 dozen at 22, 3 at 19, 1 at 15, and 4 at 14 rupees per dozen.

(6) A goldſmith has gold of 17, 18, 22 and 24 carats fine, how much muſt he take of each ſort to make 21 carats fine? Anſwer 7 carats of 24, 4 of 22, 3 of 18, and 4 of 17 carats fine.

(7) A vintner would make a mixture of Malaga worth 7rs. 8a. per gallon, with Canary at 6rs. 12a. ſherry at 5 rupees per gallon, and white wine at 4rs. 8a. and 4 rupees per gallon; what quantity of each muſt he take, that the mixture may be ſold for 6 rupees per gallon? Anſwer 72 gallons of 7rs. 8a. 16 at 6rs. 12a. 36 at 5rs. 24 at 4rs. 8a. and 24 at 4 rupees per gallon.

Note, This ſum will admit of being linked above 20 different ways.

ALLIGATION PARTIAL,

ALLIGATION PARTIAL is when the rates of all the things, the quantity of but one of them, and the mean rate of the whole mixture are given to find the ſeveral quantities of the reſt in proportion to the quantity given.

RULE.

Firſt take the differences between each price, and the mean rate, and place them alternately, as in Alligation alternate. Then ſay

As the difference of the ſame name with the
quantity given
Is to the reſt of the differences ſeverally;
So is the quantity given
To the ſeveral quantities required.
Or As the difference oppoſite the price of which
the quantity is given
Is to the ſaid given quantity,
So is each other difference
To the quantity required.

Prove queſtions in this rule as in Alligation Alternate.

(1) How much water muſt I mix with 63 gallons at 4rs. 1a. per gallon, to reduce it to 3rs. 6a. per gallon?

1ſt way. a.

Mean price 54 $\left\{\begin{array}{r} 65 \\ 0 \end{array}\right]\!\!\begin{array}{r} 54 \\ 11 \end{array}\Big\}$ differences.

Sum of the differences 65

op. diff. giv. quan. other diff. its quantity.

54a. : 63 gals. : : 11a. : $12\frac{45}{54}$ gals. Anſr.

2d way.

op. diff. giv. quan. ſum diff. whole quantity.

54a. : 63 gals. : : 65a. : $75\frac{45}{54}$ gals.

$75\frac{45}{54}$ gals. — 63 gals. = $12\frac{45}{54}$ gals. Anſwer.

PROOF.

$12\frac{45}{54}$ gals. at 0 = 0

63 gals. at 65a. = 4095 a.

75) 4095($54\frac{45}{75}$ a.

$54\frac{45}{75}$ a. = 3rs. 6a. as required.

(2) A man being determined to mix 12 maunds of gram at 18 annas per maund, with kolye at 30 annas, peas at 36 annas, and beans at 48 annas per maund; I demand how much kolye, peas and beans muſt be mixed with 12 maunds of gram that it may bear rhe price of 22 annas per maund? Anſwer 1 maund of each ſort.

(3) A man being determined to mix 12 maunds of beans at 3 rupees per maund with peas at 2rs. 8a. with kolye at 1r. 8a. and with gram at 12 annas per maund; I demand how much peas. kolye and gram muſt be mixed with the 12 maundsof beans, that the whole may be ſold for 1r. 12a. per maund? Anſwer 15mds. at 2rs. 8a. 9 at 1r. 8a. and 24 at 12 annas per maund.

(4) A man mixed 10 maunds of potatoes at 1r. 8a. per maund with other potatoes at 2rs. 8a. at 3rs. and at 4rs. per maund: I demand how much he mixed with the 10 maunds at 1r. 8a. that the whole may bear the price of 2rs. 12a. per maund? Anſwer 8mds. at 2rs. 8a. 8mds. at 3rs. and 10mds at 4rs. per maund

(5) Required to mix 12 maunds of rice at 18 annas per maund with patcherry rice at 30 annas per maund, with Patna rice at 36 annas, and Dacca rice at 48 annas per maund: I demand how much of each ſort muſt be mixed with the 12 maunds, that the whole quantity may bear the price of 42 annas per maund? Anſwer 12mds. at 30a. 12mds. at 36a. and 84mds. at 48a. per maund.

(6) With 60 gallons of brandy at 4 rupees per gallon I mix brandy of 3rs 8a. per gallon, and ſome water; then I find, it ſtood me in 3 rupees per gallon; I demand how much brandy and how much water I took? Anſwer 60 gallons of brandy at 3rs. 8a. per gallon, and 30 gallons of water.

(7) How much Malaga of 7rs. 5a. per gallon, and ſherry at 5rs. 2a. per gallon, and white wine of 4rs. 2a. the gallon muſt be mixed with 20 gallons of Canary at 6rs. 8a. per gallon, ſo that one gallon of the mixture may ſtand me in 6 rupees? Anſwer 42gals. $3\frac{6}{14}$ qts. of Malaga, 11gals. 1qt. $\frac{10}{14}$ of ſherry, and 30gals. of white wine.

ALLIGATION TOTAL.

ALLIGATION Total is when the rates of the ſeveral things, the quantity to be compounded, and the mean rate of the whole mixture are given to find, how much of each ſort will make up the quantity.

RULE.

Firſt place the differences between the ſeveral prices and the mean rate alternately as in Alligation Alternate, then ſay.

As the ſum of the differences
Is to the whole compoſition;
So is the differences of each rate
To the quantity of the ſame rate.

(1) A chandler has 4 ſorts of ſugar, viz. at 8 annas per ſeer, at 6 annas per ſeer, at 4 annas per ſeer, and at 2 annas per ſeer, and he would have a compoſition of a maund weight worth 5 annas per ſeer, I demand, how much of each ſort he muſt take?

$$\text{mean price } 5\left\{\begin{array}{c}\text{as.}\\8\\6\\4\\2\end{array}\right. \quad \left.\begin{array}{c}\\3\\1\\1\\3\end{array}\right\}\text{differences.}$$

8 ſum of differences.

ſum dif.	w. comp.	1 ſt dif.	its quan.
8a. :	40ſrs. : :	3a. :	15ſrs.

ſum dif.	w comp.	2d dif.	its quant.
8a. :	40ſrs. : :	1a. :	5ſrs.

$$\text{Anſwer.}\left\{\begin{array}{l}\text{ſrs.}\\15 \text{ at } 8\text{a. per ſeer} = 120\text{a.}\\5 \text{ at } 6\text{a. per ſeer} = 30\text{a.}\\5 \text{ at } 4\text{a. per ſeer} = 20\text{a.}\\15 \text{ at } 2\text{a. per ſeer} = 30\text{a.}\end{array}\right.$$

40 proof. 40)200(5a. per ſeer as required

(2) A vintner has 4 ſorts of wine, viz. Canary at 10 rupees per gallon, Malaga at 8 rupees per gallon, Rheniſh at 6 rupees, and Oporto at 4 rupees, and he is minded to make a compoſition of 60 gallons worth 9 rupees per gallon. I demand how much of each ſort he muſt have? Anſwer 45 gallons of Canary, and of Malaga, Rheniſh and Oporto, each 5 gallons.

(3) A punch wallah has 3 ſorts of arrack viz. at 10 annas per gallon, at 8 annas per gallon, and at 6 annas per gallon, and he would have a compoſition of 30 gallons, worth 7 annas per gallon, I demand how much of each ſort he muſt have? Anſwer 5 gallons at 10a. 5 at 8a. and 20 at 6a. per gallon.

(4) A goldſmith has ſeveral ſorts of gold viz. ſome of 24 carats fine, ſome of 22 carats fine, and ſome of 18 carats fine, and he would have compounded of theſe ſorts, the quantity of 60 ounces of 20 carats fine: I demand, how much of each ſort he muſt take? Anſr. 12 ounces of 24 carats, 12 of 22 and 35 of 18 carats fine.

(5) A goldſmith has gold of three ſorts, viz. 6 of 22 carats fine of 21 carats fine, and of 20 carats fine, and he would mix with theſe ſo much alloy, as that the quantity of 21 ounces may bear 18 carats fine, I demand how much of each ſort he muſt take, and how much alloy? Anſr. 6 ounces of each ſort and 3 ounces of alloy.

(6) A druggiſt has 3 ſorts of drugs, one was worth 4 rupees per ſeer, another 5 rupees per ſeer, and another 8 rupees per ſeer, and out of theſe he made two parcels, one was 21 ſeers at 6 rupees per ſeer, and another 35 ſeers at 7 rupees per ſeer, how much of each ſort did he take for each parcel? Anſr. 6 ſrs. at 4 rs. 6 ſrs. at 5 rs. and 9 ſrs. at 8 rs. firſt parcel, and 5 ſrs. at 4 rs. 5 ſrs. at 5 rs. and 25 ſrs. at 8 rs. ſecond parcel.

(7) Let it be required of a perſon to mix gram at 5 rupees per maund with kolye at 3 rs. 8. a. per maund;

maund, ſo as the whole quantity may be 27 maunds, to be ſold for 4 rs. 4 a. per maund: what quantity of each muſt be taken to make up the mixture? Anſr. 13mds. 20 ſrs. of each ſort.

SINGLE POSITION.

POSITION by ſome called the Rule of Falſe or Negative Arithmetick, becauſe we ſuppoſe ſome uncertain number, that by reaſoning from it, we may gain a true number.

RULE

Single poſition requires only one ſuppoſition to diſcover the true reſult.

Suppoſe any number you think proper, and work with it as if it was the true number in the ſame proportion as the queſtion directs, and if the reſult be either too much, or too little, you may find out the number ſought by this proportion.

As the reſult of the poſition
Is to the poſition;
So is the given number
To the number required.

Prove theſe ſums by working with the required number as the queſtion directs.

(1) A. lent B a ſum of money to be paid at 4 payments, when 3 of them were made, and A. came to demand the fourth, B. would give him no

more, except he would tell him, how much was paid already. A. ſaid the firſt payment was a fourth, the ſecond a fifth, and the third a ſixth of the ſum firſt lent; and all together made 74 rupees; I demand the ſum lent?

Suppoſe 60 rupees

$\frac{1}{4}$ — 15
$\frac{1}{5}$ — 12
$\frac{1}{6}$ — 10

37 rupees reſult.

reſult. poſition. given number. required number.
37 : 60 :: 74 : 120rs. anſwer.

ſum lent 120 rupees.

$\frac{1}{4}$ — 30
$\frac{1}{5}$ — 24
$\frac{1}{6}$ — 20

rupees 74 proof.

(2) One man carrying a bag of money in his hand, another aſked him, how much was in it; he anſwered, he could not tell; but the third, fourth and fifth of it made 94 rupees: how much was in the bag? Anſwer 120 rupees.

(3) I have delivered to a banker a certain ſum of money; to receive of him after the rate of 6 rupees per cent per annum; and at the end of 10 years he paid me 500 rupees for principal and intereſt together: I demand the ſum delivered to him at firſt? Anſwer 312rs. 8a.

(4) Three perſons, viz. A. B. C. thus diſcourſe together concerning their ages; ſays B. to A. I am as old and half as old again as you; then ſays C. to B, but I am twice as old as you; A. replied I am ſure the ſum of all our ages is 165: now I demand each man's age? Anſwer A.'s Age is 30 years, B.'s age 45 years, and C.'s age 90 years.

(5) Three perſons, Andrew, Benjamin and Charles, are to go a journey of 235 miles; of this journey Andrew is to go a certain number of miles unknown; Benjamin is to go four times as many miles as Andrew, and 3 miles more, and Charles is to go twice as many miles as Benjamin, and 5 miles more: how many miles muſt each of theſe perſons travel ſeverally? Anſwer Andrew muſt go 17 miles, Benjamin 71 miles, and Charles 147 miles.

(6) There were in company together four perſons, Dick, Tom, Bob, and Harry; Dick told Bob, that he was older than him by two years; Tom told him, that he was as old as both of them together, and four years older; Harry hearing them, ſaid I am juſt 96 years old, and that is equal to all your ages; how old was each of them ſeverally? Anſwer Dick's age was 24 years, Tom's 50, and Bob's 22.

(7) Bought 5 maunds of ſilk of three different qualities viz. A 1 maund, B 1½ maund, and C 2½ maunds, at 9 rupees per ſeer, one with another. How ought I to ſell a ſeer of each quantity to gain 10 per cent upon the whole, when the quantity of A is double the value of B, and the quantity of B double the value of C? Anſwer A muſt be ſold for 20rs. 13a. 6p. per ſeer, B for 10rs. 6a. 9p, per ſeer, and C for 5rs. 3a. 4p. per ſeer.

DOUBLE POSITION.

DOUBLE POSITION is that, which diſcovers the true number ſought by making uſe of two ſuppoſed numbers.

RULE I.

Firſt, Suppoſe any two numbers, and proceed with them, as if they were the true numbers in the ſame proportion as the queſtion directs.

Secondly, the reſult or errours muſt be placed againſt their poſition or ſuppoſed numbers, thus:

pos.	er.
40.	28.
36.	19.

Thirdly, multiply them croſswiſe.

Fourthly, if the errours are alike, i. e. both greater or both leſs than the given number, take their difference for a diviſor, and the difference of their products for a dividend.

Fifthly, if the errours are unlike take their ſum for a diviſor, and the ſum of the products for a dividend, the quotient thence ariſing will be the anſwer.

RULE II.

As the difference of the errours, if alike, or their ſum, if unlike: is to the difference of the ſuppoſitions: ſo is either of the errours to a fourth number, which added to, or ſubſtracted from its proper ſuppoſition, gives the number ſought.

RULE III.

Firſt, multiply the difference of the ſuppoſed numbers by the leaſt errour, and divide the product by the difference of the errours if they are alike; or by the ſum, if unlike: the quotient is the correction of the number belonging to the errour.

Secondly, obſerve whether this be the leſs or greater number, as alſo whether the erruors have like or unlike ſigns.

Thirdly, if it is the leſs number, and like ſigns, add the correction; if unlike, ſubſtract it, but if it is the greateſt and unlike ſigns ſubſtract the errour, if alike add it.—Prove theſe ſums as in ſingle poſition.

(1) A. B. and C. would divide 100 rupees, between them, ſo as that B. may have 3 rupees more than A. and C. 4 rupees more than B: I demand how much each man muſt have?

By rule the firſt when the ſigns are alike.

firſt ſuppoſition.	ſecond ſuppoſition
ſuppoſe A. had 18 rs.	ſuppoſe A. had 25 rs.
21	28
25	32
64	85

100—64= 36 firſt errour—

100—85 = 15 ſecond errour—

$$\text{poſitions}\left\{\begin{array}{cc}18 & 36\\ 25 & 15\end{array}\right\}\text{errours.}$$

$$\left.\begin{array}{l}36 \times 25 = 900\\ 18 \times 15 = 270\end{array}\right\}\text{products.}$$

900—270 = 630 difference of products.

36— 15 = 21 difference of errours.

21) 630rupes A. had Anſwer.

By rule the 2d.

25—18=7 diff. of ſuppoſitions.

dif. of er.		dif. of ſup.		firſt er.		fourth number.
21	:	7	::	36	:	12

firſt ſup. 18 + 12 = 30rs. A.'s portion

Again.

diff. of er.		diff. of ſup.		2d. er.		4th num.
21	:	7	::	15	:	5

2d ſup. 25 + 5 = 30rs. A.'s portion.

By Rule 3d.

leaſt er. 15 × 7 diff. of ſup. = 105 product.

diff. of er. 21)105(5 correction of ſuppoſed number belonging to the leaſt errour.

25 + 5 = 30 A.'s portion anſwer.

By Rule 1ſt when the ſigns are unlike.

1ſt ſuppoſition.	2d ſuppoſition.
Snppoſe A. had 25 rupees.	Suppoſe A. 32 rupees.
28	35
32	39
— 85	+ 106

100 — 85 = 15 firſt errour —

106 — 100 = 6 ſecond errour +

$$\text{Poſitions}\left\{\begin{matrix}25\\32\end{matrix}\right. \qquad \left.\begin{matrix}15\\6\end{matrix}\right\}\text{errours.}$$

$$\left.\begin{matrix}25 \times 6 = 150\\32 \times 15 - 480\end{matrix}\right\}\text{products.}$$

480 + 150 = 630 ſum of products.

$15 + 6 = 21$ ſum of errours.

21)630(30 rupees A. had, anſwer.

By Rule the 2d.

$32 - 25 = 7$ diff. of ſuppoſitions.

ſum of er. diff of ſup. 1ſt er. 4th num.

$21 : 7 :: 15 : 5$

1ſt ſup. $25 + 5 = 30$ A.'s portion.

Again,

ſum of er. dif. of ſup. 2d er. 4th num.

$21 : 7 :: 6 : 2$

2d ſup. $32 - 2 = 30$ A.'s portion.

By Rule 3rd,

dif. of ſup.

leaſt er. $6 \times 7 = 42$ product.

$15 + 6 = 21$ ſum of errours.

21)42(2 correction of ſuppoſed Number belonging to the greateſt errour.

$32 - 2 = 30$ A's. portion.

PROOF.

A. had 30 rupees.
B. 3 more 33
C. 4 more 37

In all 100 rupees.

(2) A man lying at the point of death, ſaid he had in certain coffer's 10000 rupees which he bequeathed to 3 of his friends after this manner:--The firſt muſt have a certain portion, the ſecond muſt have twice as much as the firſt wanting 800 rupees, and the

third muſt have three times as much as the firſt wanting 1500 rupees: I demand, how much each man muſt have? Anſwer the firſt muſt have 2050rs. the ſecond 3300 rs. and the third 4650 rs.

(3) A. B. and C. built an houſe, which coſt 10,000 rupees, of which A paid a certain ſum, B paid 1000 rupees more than A. and C. paid as much as A and B: I demand, each man's ſhare in that charge? Anſwer A. paid 2000 rs. B. 3000 rs. and C. 5000 rs.

4) A young gentleman walking in a garden, and meeting with a bevy of young ladies, began thus to addreſs them: Bleſs you all ten fair ladies; ſir, replies one, you are miſtaken, we are not ten, but if we were twice as many more as we are, we ſhould be as many above 10, as we are now below: what was their number? Anſwer 5 ladies.

(5) A gentleman has two horſes of good value, and a ſaddle worth 500 rupees, which ſet on the back of the firſt horſe made his value double that of the ſecond; but if ſet on the back of the ſecond horſe is worth triple that of the firſt horſe. I demand the value of each horſe? Anſwer 300 rupees is the value of the firſt horſe, and 400 rupees the value of the ſecond.

(6) A lady bought lace at 4 rupees a yard, and Perſian at 2 rupees; the whole number of yards ſhe bought were eight, and the whole price 20 rupees: how many yards had ſhe of each ſort? Anſr. 2 yards of ſilk at 4 rupees per yard, and 6 yards of Perſian at 2 rupees per yard.

(7) A. and B. having a certain number of gold mohurs, ſays B. to A. give me one of your gold mohurs, and

I ſhall have as many as you; but ſays A. to B. give me one of your gold mohurs, and I ſhall have twice as many as you; how many had each? Anſwer A. had 8 and B. 4 gold mohurs.

ARITHMETICAL PROGRESSION.

ARITHMETICAL PROGRESSION is a rank or ſeries of numbers increaſing or decreaſing by a common difference or by a continual addition or ſubſtraction of ſome equal numbers.

As { 1, 2, 3, 4, 5, 6, 7, 8, 9
 9, 8, 7, 6, 5, 4, 3, 2, 1 } common difference 1.

Or 1, 3, 5, 7, 9, 11, 13, common difference 2.

Alſo 42, 35, 28, 21, 14, 7, common difference 7..

In an Arithmetical Progreſſion are five things, any three of which being given the other two may be found, which admit of twenty different propoſitions.

1ſt, The firſt term commonly the leaſt }
2d, The laſt term commonly the greateſt } extremes.

3d, The number of terms.

4th, The common exceſs or difference.

5th, The Aggregate or ſum of all the terms.

Firſt, if any three numbers are in Arithmetical Progreſſion the ſum of the two extreames, viz. the firſt and laſt will be equal to the double of the mean or middle number.

As in theſe 3. 8. 13 viz. $3 + 13 = 8 + 8$
Or 1. 7. 13 $1 + 13 = 7 + 7$
And 7. 14. 21 $7 + 21 = 14 + 14$ Se-

Secondly, if four numbers are in Arithmetical Progreſſion, the ſum of the two extremes will be equal to the ſum of the 2 means.

As 1, 3, 5, 7, viz. $1 + 7 = 3 + 5$
And 5, 8, 11, 14, -- $5 + 14 = 8 + 11$

Thirdly, Alſo if many numbers be in arithmetical progreſſion, the ſum of the two extremes will be equal to the ſum of any two means, that are equally diſtant from the extremes.

7, 9, 11, 13, 15, 17,
viz. $7 + 17 = 9 + 15 = 11 + 13$,
Or if the numbers be added,
1, 3, 5, 7, 9, 11, 13,
$1 + 13 = 3 + 11 = 5 + 9 = 7 + 7$

Fourthly, Every ſeries of numbers in Arithmetical Progreſſion is compoſed of the exceſs or common difference, ſo often repeated, as there are terms in the Progreſſion, except the firſt.

As in theſe 2, 5, 8, 11, 14, 17,
here the common difference being 3
then will $2 + 3 = 5$, $5 + 3 = 8$, $8 + 3 = 11$
$11 + 3 = 14$, $14 + 3 = 17$, &c.

Fifthly, Hence may be obſerved that the difference between the two extremes, 2 and 17, is compoſed of the common difference multiplied into the number of all the terms, except the firſt.

In the aforeſaid Progreſſion 2, 5, 8, 11, 14, 17,

$$\left.\begin{array}{lr} \text{the number of terms without the firſt is} & 5 \\ \text{the common difference} & \underline{3} \end{array}\right\} \text{multiply,}$$

the difference of the two extremes $\underline{\underline{15}}$

PROPOSITION I.

The two extremes, and number of terms being given to find the ſum of all the ſeries.

RULE.

Multiply the ſum of the two extremes into the number of terms, and divide the product by 2, the quotient will be the ſum of all the ſeries.

(1) How many ſtrokes do the clocks of Venice (which go on to 24 o'clock) ſtrike in the compaſs of a natural day?

1 }
24 } extremes.
25 ſum of extremes.
24 number of terms.
100
50
2)600 product.
Anſwer. 300 ſtrokes in a day.

(2) The length of my garden is 94 feet: now if eggs be laid along the pavement a foot aſunder, to be fetched up ſingly to a baſket removed one foot from the laſt, how much ground muſt he travel, that does it? Anſwer 1 mile, 5 furlongs, 21 perches, 1 yard, 6 inches.

PROPOSITION II.

(2) The firſt term, the common exceſs, and the number of terms being given, to find the ſum of all the ſeries.

RULE

From the product of the number of terms in the common exceſs, ſubſtract the common exceſs, and to the remainder add the double of the firſt term; half the product of that ſum, multiplied by the number of terms, gives the ſum of all the ſeries.

(1) A gentleman bargains with a bricklayer to ſink him a well 20 fathoms deep, upon theſe terms, viz. to pay him 3 rupees for the firſt fathom, 5 for the ſecond, 7 for the third, &c. raiſing two every fathom: what will be due to the bricklayer for compleating the ſame? Anſwer 440 rupees.

(2) Bought 19 yards of ſhalloon, and gave 1 rupee for the firſt yard, 3 rupees for the ſecond, 5 rupees for the third, &c. increaſing 2 rupees every yard: I demand, what I gave for the 19 yards? Anſwer 361 rupees.

(3) A mercer ſold 20 yards of ſilk, at 3 rupees for the firſt yard, 6 rupees for the ſecond, 9 rupees for the third, &c. increaſing 3 rupees every yard: I demand, what he ſold the 20 yards for? Anſwer 630 rupees.

(4) A butcher bought 100 heads of cattle, viz. oxen, and gave for the firſt ox 1 rupee, for the ſecond ox 2 rupees, for the third ox 3 rupees, &c. I demand, what the cattle coſt him? Anſwer 5050 rupees.

PROPOSITION III.

The firſt term, number of terms, and ſum of all the ſeries given to find the common exceſs.

RULE.

Divide the double ſum of all the ſeries by the number of terms, and from the quotient ſubſtract double the firſt term: divide the remainder by the number of terms leſſened by unity, the quotient will be the common exceſs.

(1) A gentleman travelled 100 leagues in eight days and every day travelled equally farther than the preceeding day: it is known that the firſt day he travelled two leagues: how many leagues did he travel each of the other days? Anſwer 3 leagues common exceſs.

PROPOSITION IV.

The two extremes, and number of terms being given to find the common difference or exceſs.

RULE.

The difference of the two extremes divided by the number of terms leſs unity, the quotient will be the common exceſs.

(1) One had 12 children, that differed alike in their ages, the youngeſt was nine year's old, the elder 36 $\frac{1}{2}$: what was the difference of their ages, Anſwer 2 $\frac{1}{2}$ years between each of their births.

(2) There are 21 men, whoſe ages are equally diſtant from each other in Arithmetical Progreſſion,

the youngeſt is 20 years old, and the eldeſt is 60: I demand the common difference of their ages? Anſwer the difference of their ages is 2 years.

(3) A debt is to be diſcharged at 11 ſeveral payments in arithmetical progreſſion, the firſt payment to be 12rs. 8a. and the laſt 63 rupees: what is the debt, and what muſt each payment be? Anſwer the whole debt was 415rs. 4a. and the common exceſs or difference was 5rs. 0a. 9p.

(4) A man is to travel from Calcutta to a certain place in ten days, and to go but two coſs the firſt day, increaſing every day's journey by an equal exceſs, ſo that the laſt day's journey may be 29 coſs: what will each day's journey be, and how many coſs is the place he goes to diſtant from Calcutta? Anſwer each day's journey is 3 coſs, and the whole diſtance 155 coſs from Calcutta.

PROPOSITION V.

The two extremes and the common exceſs given to find the number of terms.

RULE.

Divide the difference of the two extremes by the common exceſs, the quotient plus unity is the number of terms.

(1) A man going a journey, his firſt day's travel was 5 coſs, his laſt day's travel 35 coſs, he increaſed his journey every day 3 coſs: how many days did he travel? Anſwer 11 days' journey.

PROPOSITION

PROPOSITION VI.

The common exceſs, number of terms and ſum of all the ſeries given to find the firſt term.

RULE.

Divide the ſum of all the ſeries by the number of terms, and from the quotient ſubſtract half the product of the common exceſs into the number of terms leſs unity, the remainder will be the firſt term.

(1) Suppoſe it 100 coſs between Calcutta and Berhampore, two hircarrahs ſet out from each place on the ſame road, that from Calcutta towards Berhampore, travelling every day two coſs more than the day before; the other from Berhampore to ſet off one day after, travelling every day three coſs more than the preceding one, and that they meet exactly half way; the firſt at the end of five days, and the other at the end of four: how many coſs did each travel each day? Anſwer the firſt man's 5 day's journey were 6, 8, 10, 12, 14, coſs, and the other's 4 day's journey were 8, 11, 14, 17, coſs.

(2) A man is to receive 300 rupees at 12 ſeveral payments, each payment to exceed the former by four rupees: he is willing to beſtow the firſt payment on any one, that can tell him, what it is? what muſt the Arithmetician have for his pains. Anſwer 3rs. = 1ſt payment.

PRO-

PROPOSITION. VII.

The laſt term, number of terms, and common exceſs given to find the firſt term.

RULE.

Multiply the common exceſs into the number of terms leſs unity, the product ſubſtracted from the laſt term leaves the firſt.

(1) A man in ſix days went from Calcutta to Moorſhedabad, every day's journey was greater than the preceding one by four coſs, his laſt day's journey was 40 coſs, what was the firſt. Anſwer 20 coſs was the firſt day's journey.

PROPOSITION. VIII.

When one perſon, or thing moves with an equal, and another the ſame way by a progreſſive motion, to find in what time the firſt will be over taken.

RULE.

Add the common exceſs of the purſuer's day's journey to double the ſpace gone each day by the purſued, from that ſum ſubſtract double the ſpace, that the purſu er travelled the firſt day, and divide the remainder by the common exceſs, the quotient will give the number of days, in which the purſued will be overtaken by the purſuer.

(1) A noted decoit having committed a robbery, not ſuſpecting a purſuit, fled northward at the rate of eight coſs a day; a ſepoy upon the ſcent follows him in a progreſſive motion, only 3 coſs the firſt day, 5 the next, 7 the third, and ſo on increaſing every day 2 coſs: in how many days will the decoit be overtaken? Anſwer 6 days.

Geo-

Geometrical Progreſſion.

GEOMETRICAL PROGRESSION is when any rank or ſeries of numbers increaſe by one common multiplier, or decreaſe by one common diviſor.

As 2, 4, 8, 16, 32, 64; here 2 is the common multiplier,

And 1215, 405, 135, 45, 15. 5; here 3 is the common diviſor.

Note. The common multiplier or diviſor is called ratio.

Here note, that if three numbers are in geometrical progreſſion, the product of the two extremes will be equal to the ſquare of the mean or middle term, as in theſe, 2, 4, 8.

Here $2 \times 8 = 4 \times 4$ each being $= 16$

Alſo, if four numbers are in geometrical progreſſion, the product of the two means will be equal to the product of the two extremes, as in theſe 135, 45, 15, 5.

Here $135 \times 5 = 45 \times 15$ each being 675,

Hence if ever ſo many numbers are in geometrical progreſſion, the product of the two extremes will be equal to the product of any two means, that are diſtant from the extremes,

As in theſe 3, 9. 27, 81, 243, 729,

Here $3 \times 729 = 9 \times 243 = 27 \times 81 = 2187$.

Or if the number of terms be added as in theſe,

3, 9, 27, 81, 243, &c.

3,

$$3 \times 243 = 9 \times 81 = 27 \times 27 = 729.$$

In any geometrical progreſſion, the ſame things are to be taken notice of, as in arithmetical progreſſion.

Viz. Firſt, The firſt term commonly the leaſt,

Secondly, The laſt term commonly the greateſt,

Thirdly, The number of terms,

Fourthly, The ratio, or common multiplier or diviſor, and

Fifthly, the ſum of all the ſeries.

Any three of theſe being known, the reſt may be found.

If to any ſeries of numbers in geometrical progreſſion not proceeding from unity, there be aſſigned a ſeries of numbers in arithmetical progreſſion beginning with an unit or 1, whoſe common difference is 1, called Indices or Exponents.

Thus
1, 2, 3, 4, 5, 6, 7, indices
2, 4, 8, 16, 32, 64, 128, terms

then will the addition or ſubſtraction of thoſe indices (or numbers in arithmetical progreſſion) directly correſpond with the product or quotient of their reſpective terms or ſeries in geometrical progreſſion,

That is
as $3 + 4 = 7$
ſo $8 \times 16 = 128$ the ſeventh term in the progreſſion.

Again
alſo $7 + 7 = 14$
ſo $128 \times 128 = 16384$ the fourth term in the progreſſion.

Or as $7 - 3 = 4$,
ſo $128 \div 8 = 16$, the fourth term in the progreſſion.

Or as $6 - 1 = 5$,
ſo $64 \div 2 = 32$, the fifth term in the progreſſion.

But if the ſeries begin with unity, the indices muſt begin with a cypher,

Thus
0, 1, 2, 3, 4, 5, 6, 7; indices
1, 2, 4, 8, 16, 32, 64, 128. terms

Now by theſe indices, and a few leading terms, the laſt term or any diſtant one may be ſpeedily found.

PROPOSITION I.

The firſt term being unity, the ratio and number of terms being known, to find the laſt, or any remote term.

RULE.

Find a few of the leading terms, over which place their indices as before directed, then multiply the laſt found by itſelf, which will produce a term double thereto, and ſo proceed, till you either arrive at the term ſought, or one, that falls a little ſhort of it; if ſo multiply the term laſt found by that term anſwering the difference of the indices of the laſt found term and that ſought, which laſt product will be the term required.

(1) A cunning ſircar told his maſter, he had 25 pieces of very good handkerchiefs for ſale: upon aſking their price, was anſwered, he ſhould have them for 4 rupees one with another. The gentleman offers him 3 rupees each, and take all; the ſircar tells him it would not be taken; but if he would give him, what the 20th would come to, by beginning at the firſt with a ſingle pice, and doubling only to the 20th, he ſhould have them all: what did they come to a piece?

$$\text{Firſt}\left\{\begin{array}{l}0,\ 1,\ 2,\ 3,\ 4,\ 5,\ \text{indices}\\ 1,\ 2,\ 4,\ 8,\ 16,\ 32,\ \text{terms}\end{array}\right.$$

$$\text{Then}\left\{\begin{array}{l}5 + 5 = 10\\ 32 \times 32 = 1024\end{array}\right. \quad \text{Alſo}\left\{\begin{array}{l}4 + 5 = 9\\ 16 \times 32 = 512\end{array}\right.$$

$10 + 9 = 19$

$1024 + 512 = 524288$ pice, which is the 20th term, as the indices are leſs than the term by one, and 524288 pice, the price of the whole, being divided by 25 are equal to 20971$\frac{13}{25}$ pice, or 109 rs. 3 a. 7 p. $\frac{13}{25}$ the price of each piece.

(2) A man bought a horſe, and by agreement, was to give a pice for the firſt nail, 2 for the ſecond, 4 for the third, &c. There were 4 ſhoes, and 8 nails in each ſhoe: I demand, what the horſe was worth at that rate? Anſwer 22369621 rs. 5 a. 3 p.

But if the firſt term of any ſeries be greater than unity, that and the ratio being known, to find any remote term without producing the reſt,

Find

RULE.

Find a few of the leading terms, as before directed, then multiply the laſt term ſo found, by itſelf, and and divide the product by the firſt term, and this again multiplied by the term, as is wanting and divided by the firſt, gives the term required.

(3) A perſon dying left ten ſons, to whom, and to his executor, he bequeathed his eſtate in the manner following, viz. to his executor for ſeeing his will performed 1024 rupees, the youngeſt ſon to have as much and half as much, and every ſon to exceed the next younger in the ſame ratio of $1\frac{1}{2}$, what is the ſhare of the eldeſt? Anſwer 59049 rupees eldeſt ſon's ſhare.

PROPOSITION II.

The firſt term ratio, and laſt term, given to find the ſum of all the ſeries.

RULE.

Multiply the laſt term into the ratio, and from the product ſubſtract the firſt term, divide the remainder by the ratio leſs unity; the quotient will be the ſum of all the ſeries.

(1) On new-year's day a gentleman married, and received of his father-in-law a gold-mohur, on condition that he was to have a preſent on the firſt day

of every month for the firſt year, which ſhould be double ſtill, to what he had the month before: what was the lady's portion? Anſwer 65520 rs.

(2) One at a ſale of horſes had a mind to a ſtring of 20 fine one's; but not caring to take them at 20 gold mohurs per head, the jockey conſented, that he ſhould, if he thought good, pay but a ſingle anna for the firſt, doubling it only to the 19th, and he would give the 20th into the bargain: this being preſently accepted, how were they ſold? Anſwer 32767 rs. 15 a.

(3) A merchant ſold 15 cubits of ſattin, the firſt cubit for 1 anna, the ſecond for 2 annas, the third for 4 annas, the fourth for 8 annas, &c. I demand, the price of the 15 cubits? Anſwer 2047 rs. 15 a.

(4) A draper ſold 20 yards of ſuperfine cloth, the firſt yard for 3 pice, the ſecond for 9 pice, the third for 27 pice, in triple proportion geometrical: I demand, the price of the cloth? Anſr. 27240503 rupees, 2 annas, the price of the cloth.

(5) A goldſmith ſold a ſeer of gold at 1 pice for the firſt chahtack, 4 pice for the ſecond, 16 pice for the third, &c. in quadruple proportion geometrical: I demand, what he ſold the whole for? alſo how much he gained by the ſale thereof, ſuppoſing he gave for it 80 rupees per chahtack? Anſwer 7456540 rs. 7 a. 1 p. amount of ſale, and 7455260 rs. 7 a. 1p. gain.

(6) A man worked 20 days at a farmer's, and received for the firſt day's work 4 grains of rice,

for the ſecond 12 grains of rice, for the third 36 grains of rice, and ſo on in triple proportion geometrical: I demand, what the 20 days labour came to, ſuppoſing the whole quantity to be ſold at 30 ſeer per rupee, and each ſeer containing 15360 grains. Anſwer 15133 rejecting remainders.

(7) A merchant ſold 30 yards of fine velvet, trimmed with gold very curiouſly, at 2 pins for the firſt yard, 6 pins for the ſecond, 18 pins for the third, &c. in triple proportion geometrical: I demand, how much the velvet produced, when the pins were afterwards ſold at 100 for a pice? alſo, whether the ſaid merchant gained or loſt by the ſale thereof, and how much, ſuppoſing the ſaid velvet to have been bought at 200 rupees per yard? Anſwer 10723496463 rs. 4 a. 2 p. produce, and 10723490 63 rs. 4 a. 2 p. gain.

(8) A cunning ſervant agreed with a maſter (unſkilled in numbers) to ſerve him eleven years without any reward for his ſervice: but the produce of a grain of rice for the firſt year, and that product to be ſowed the ſecond, and ſo on, from year to year, allowing the increaſe to be in a tenfold proportion; it is required to find the ſum of the whole produce? Anſwer 111111111110 which at 15360 grains in one ſeer make 180844 mds. 36 ſeers.

(9) It is reported, that one Seſſa, in India, having firſt invented the game at Cheſs, ſhowed it to his Prince Shekram. The King being highly pleaſed with it, bid him aſk, what he would for the reward of his

invention: whereupon he aſked that for the firſt little ſquare of the cheſs-board, he might have one grain of rice given him, for the ſecond two, and ſo on, doubling continually according to the number of ſquares on the cheſs-board, which were 64: the King, who intended him a noble reward, was diſpleaſed that he had aſked ſo trifling a one; but Seſſa declaring he would be contented with this, it was ordered to be given him; and the King was aſtoniſhed, when he found, that this would raiſe ſo vaſt a quantity that even the whole earth could not produce it? ſo you are deſired to repeat the operation, and find the price of the whole, ſuppoſing 15360 grains to be in one ſeer, and thirty ſeers are valued at one rupee? Anſwer 40031996687737 $\frac{22}{30}$ rupees.

PERMUTATION.

BY Permutation is meant the different ways any number of things may be altered or changed in reſpect to their places.

To find the number of different changes, that may be rung on any propoſed number of bells.

RULE.

Multiply all the terms in a ſeries of arithmetical progreſſionals continually, whoſe firſt term, and common difference is unity or 1, and the laſt term the number of things propoſed to be varied; the laſt product will be the number of variations required.

The changes on any number of bells not exceeding 12 are exhibited in the following

TABLE.

The num. of things propoſed to be varied.	The manner how their ſeveral variations are produced.	The different changes or variations every one of the propoſed number can admit of
1	1 × 1	=1
2	1 × 2	=2
3	2 × 3	=6
4	6 × 4	=24
5	24 × 5	=120
6	120 × 6	=720
7	720 × 7	=5040
8	5040 × 8	=40320
9	40320 × 9	=362880
10	362880 × 10	=3628800
11	3628800 × 11	=39916800
12	39916800 × 12	=479001600.

(1) I demand how many changes may be rung upon twelve bells? and alſo how long they would be in ringing but once over, ſuppoſing 24 changes might be rung in one minute, and the year to contain 365 days 6 hours?

$1\times2\times3\times4\times5\times6\times7\times8\times9\times10\times11\times12=$
479001600 changes.

24)479001600(19958400 minutes.
1 year is equal to 525960 minutes, therefore
525960)19958400(37 yrs. 49wks. 2ds. 18 hrs. anſwer.

(2) A perſon coming to Calcutta, and not thinking it worth while to keep houſe for himſelf only, was deſirous of entering into an engagement with a tavern keeper for his board and lodging during his ſtay: who was ſo unconſcionable as to demand one thouſand rupees per month; the perſon who was an arithmetician being hurt at the propoſal, was determined to be even with him if poſſible, and offered him the money on condition of being entertained ſo long as he could place his family and himſelf, in all 7 perſons, every day at dinner in different poſitions; to which the tavern-keeper readily aſſented; how long therefore ſhould he be entertained, and at what rate per annum? Anſwer 13 years 291 days at the rate of 72rs. 8a per annum nearly.

(3) Seven gentlemen, that were travelling met together by chance at a certain inn upon the road, where they were ſo well pleaſed with their hoſt and each other's company, that in a frolick they offered him 30 gold mohurs to ſtay at that place ſo long as they together with him could ſit every day at dinner in a different poſition. The hoſt thinking that they could not ſit in many different poſitions; be-

cauſe there were but a few of them, and that himſelf would make no conſiderable alteration, he being but one, imagined that he ſhould make a good bargain, and readily (for the ſake of a good dinner and better company) entered into an agreement with them, and ſo made himſelf the eighth perſon: I demand how long they ſtaid at the ſaid inn, and how many different poſitions they ſat in? Anſwer 110 yrs. and 142 days.

VULGAR FRACTIONS.

FRACTIONS are of two kinds, viz. Vulgar and Decimal. A vulgar fraction is a broken number, and ſignifies the part or parts of a whole number. Any numbers placed thus $\frac{6}{9}$ make a vulgar fraction, the upper number being the remainder after diviſion is called the numerator, and the lower number, which notes any whole divided into two parts, is the diviſor in diviſion, and is called the denominator. There are three ſorts of vulgar fractions viz. proper, improper, and compound. A proper fraction is, when the numerator is leſs than the denominator, as $\frac{6}{9}$ and may be expreſſed without end, as $\frac{1}{2}$ may be called $\frac{2}{4}$ or $\frac{3}{6}$ or $\frac{4}{8}$ &c. but the loweſt term $\frac{1}{2}$ is always deſired. An improper fraction is when the numerator is greater than the denominator as $\frac{9}{6}$ and a compound fraction is the fraction, as $\frac{1}{2}$ of $\frac{2}{3}$ or $\frac{1}{3}$ of $\frac{1}{12}$ of $\frac{1}{2}$ &c.

Reduction

Reduction of Vulgar Fractions.

CASE I.

To reduce vulgar fractions to a common denominator.

RULE.

Firſt, Multiply each numerator into all the denominators but its own for a new numerator.

Secondly, Multiply all the denominators for a common denominator.

(1) Reduce $\frac{3}{6}$ and $\frac{5}{8}$ to a common denominator.

$$\left.\begin{array}{l} 3 \times 8 = 24 \\ 5 \times 6 = 30 \end{array}\right\} \text{new numerators.}$$

$6 \times 8 = 48$ common denominator.

Anſwer $\frac{24}{48}$ $\frac{30}{48}$.

(2) Reduce $\frac{7}{8}$ $\frac{9}{10}$ and $\frac{11}{12}$ to a common denominator.

Anſwer $\frac{840}{960}$ $\frac{864}{960}$ $\frac{880}{960}$.

(3) Reduce $\frac{6}{10}$ $\frac{4}{8}$ $\frac{1}{9}$ and $\frac{6}{7}$ to a common denominator.

Anſwer $\frac{3024}{5040}$ $\frac{2520}{5040}$ $\frac{560}{5040}$ $\frac{4320}{5040}$.

(4) Reduce $\frac{4}{9}$ $\frac{7}{11}$ $\frac{6}{7}$ and $\frac{1}{2}$ to a common denominator.

Anſwer $\frac{616}{1386}$ $\frac{882}{1386}$ $\frac{1188}{1386}$ $\frac{693}{1386}$.

(5) Reduce $\frac{6}{9}$ $\frac{2}{7}$ $\frac{1}{3}$ and $\frac{7}{8}$ to a common denominator.

Anſwer $\frac{1008}{1512}$ $\frac{432}{1512}$ $\frac{504}{1512}$ $\frac{1323}{1512}$.

(6) Reduce $\frac{4}{5}$ $\frac{1}{2}$ $\frac{5}{6}$ and $\frac{2}{8}$ to a common denominator.

Anſwer $\frac{384}{480}$ $\frac{240}{480}$ $\frac{400}{480}$ $\frac{120}{480}$.

CASE II.

To reduce a vulgar fraction to it's loweſt terms.

RULE.

Firſt, Find a common meaſure by dividing the lower term by the upper, and that diviſor by the remainder following, till nothing remains. The laſt diviſor is the common meaſure.

Secondly, Divide both parts of the fraction by the common meaſure, and the quotients will make the fraction required.

Note. Firſt, if the common meaſure happen to be one, the given fraction is already in its loweſt terms.

Secondly, when a fraction has cyphers at the right hand, it may be abbreviated by cutting them off thus $\frac{7|0}{5|0}$.

(1) Reduce $\frac{48}{56}$ to it's loweſt terms.

48)56(1
48

common meaſure = 8)48(6 $\frac{48}{56} \div 8 = \frac{6}{7}$ Anſwer.
48

0

(2) Reduce $\frac{72}{94}$ to its loweſt terms. Anſr. $\frac{36}{47}$

(3) Reduce $\frac{84}{170}$ to its loweſt terms. Anſr. $\frac{42}{85}$

(4) Reduce $\frac{60}{125}$ to its loweſt terms. Anſr. $\frac{12}{25}$

(5) Reduce $\frac{182}{196}$ to its loweſt terms. Anſr. $\frac{13}{14}$

(6) Reduce $\frac{468}{1144}$ to its loweſt terms. Anſr. $\frac{117}{286}$

CASE

CASE III.

To reduce a mixt number (which is compoſed of a whole number and a fraction thus $7\frac{1}{4}$) to an improperfraction.

RULE.

Firſt. Multiply the whole number into the denominator of the fraction.

Secondly. To the product add the numerator for a new numerator.

Thirdly. Let its denominator be the denominator given.

Note. To expreſs a whole number fractionwiſe, put 1 for it's denominator.

(1) Reduce $12\frac{15}{17}$ to an improper fraction.

$$\begin{array}{r} 17 \\ 12 \\ \hline 204 \\ 15 \\ \hline 219 \end{array}$$

$\frac{219}{17}$ Anſwer.

(2) Reduce $19\frac{12}{18}$ to an improper fraction. Anſr. $\frac{354}{18}$

(3) Reduce $16\frac{18}{100}$ to an improper fraction. Anſr. $\frac{1618}{100}$

(4) Reduce $12\frac{19}{56}$ to an improper fraction. Anſr. $\frac{691}{56}$

(5) Reduce $100\frac{19}{59}$ to an improper fraction. Anſr. $\frac{5919}{59}$

(6) Reduce $79\frac{12}{19}$ to an improper fraction. Anſr. $\frac{1513}{19}$

CASE

CASE IV.

To reduce an improper fraction to its proper terms.

RULE.

Divide the upper term by the lower.

(1) Reduce $\frac{219}{17}$ to its proper terms.

```
17)219(12 15/17 Anſwer.
   17
   ——
   49
   34
   ——
   15
   ==
```

(2) Reduce $\frac{141}{17}$ to its proper terms. Anſr. $8\frac{5}{17}$

(3) Reduce $\frac{126}{48}$ to its proper terms. Anſ. $2\frac{30}{48}$

(4) Reduce $\frac{961}{17}$ to its proper terms. Anſr. $56\frac{9}{17}$

(5) Reduce $\frac{13}{7}$ to its proper terms. Anſr. $1\frac{6}{7}$

(6) Reduce $\frac{24}{7}$ to its proper terms. Anſr. $3\frac{3}{7}$

CASE. V.

To reduce a compound fraction to a ſingle one.

RULE.

Multiply all the nemerators for a new numerator, and multiply all the denominators for a new denominator.

(1) Reduce $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ to ſingle fraction.

$1 \times 2 \times 3 = 6$
— Anſwer.
$2 \times 3 \times 4 = 24$

(2) Reduce $\frac{7}{8}$ of $\frac{4}{6}$ of $\frac{9}{10}$ to a ſingle fraction. Anſ. $\frac{252}{480}$
(3) Reduce $\frac{12}{14}$ of $\frac{5}{6}$ of $\frac{1}{2}$ to a ſingle fraction. Anſr. $\frac{60}{168}$
(4) Reduce $\frac{5}{9}$ of $\frac{4}{8}$ of $\frac{3}{4}$ to a ſingle fraction. Anſr. $\frac{60}{288}$
(5) Reduce $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{4}{5}$ to a ſingle fraction. Anſr. $\frac{24}{60}$
(6) Reduce $\frac{1}{2}$ of $\frac{8}{9}$ of $\frac{6}{7}$ to a ſingle fraction. Anſr. $\frac{48}{126}$

CASE VI.

To reduce vulgar fractions of one denomination to another of the ſame value, having the numerator of the required fraction given.

RULE.

As the numerator of the given fraction is to its denominator; ſo is the numerator of the intended fraction to its denominator.

(1) Reduce $\frac{3}{4}$ to a fraction of the ſame value, whoſe numerator ſhall be 15.

15)20(1
15
—
c. m. 5)15(3
15
—
..

3 : 4 : : 15
4
—
3)60
— $\frac{15}{20} \div 5 = \frac{3}{4}$ anſwer.
20

(2)

(2) Reduce $\frac{7}{8}$ to a fraction of the ſame value, whoſe numerator ſhall be 42. Anſwer $\frac{42}{48}=\frac{7}{8}$.

(3) Reduce $\frac{3}{4}$ to a fraction of the ſame value, whoſe numerator ſhall be 31. Anſwer $\frac{34}{45\frac{1}{3}}$.

(4) Reduce $\frac{5}{9}$ to a fraction of the ſame value, whoſe numerator ſhall be 73. Anſwer $\frac{73}{131\frac{2}{5}}$.

(5) Reduce $\frac{8}{12}$ to a fraction of the ſame value, whoſe numerator ſhall be 95. Anſwer $\frac{96}{144}$.

(6) Reduce $\frac{10}{18}$ to a fraction of the ſame value, whoſe numerator ſhall be 145. Anſwer $\frac{146}{262\frac{8}{10}}$.

CASE VII.

To reduce vulgar fractions from one denomination to another of the ſame value, having the denominator of the required fraction given.

RULE.

As the denominator of the given fraction is to its numerator; ſo is the denominator of the intended fraction to its numerator.

(1) Reduce $\frac{3}{4}$ to a fraction of the ſame value, whoſe denominator ſhall be 20?

15)20(1 $\qquad$ 4 : 3 : : 20 : 15
15

c.m. 5)15(3
15
..

$\frac{15}{20}$ :: 5 = $\frac{3}{4}$ anſwer.

(2) Reduce $\frac{7}{8}$ to a fraction of the ſame value, whoſe denominator ſhall be 49? Anſwer $\frac{42}{49}\,\frac{7}{8}$.

(3) Reduce $\frac{3}{4}$ to a fraction of the ſame value, whoſe denominator ſhall be 46? Anſwer $\frac{34}{46}\,\frac{2}{4}$.

(4) Reduce $\frac{5}{9}$ to a fraction of the ſame value, whoſe denominator ſhall be 131 $\frac{2}{3}$? Anſwer $\frac{73}{131}\,\frac{2}{3}$.

(5) Reduce $\frac{8}{12}$ to a fraction of the ſame value, whoſe denominator ſhall be 144? Anſwer $\frac{96}{144}$.

(6) Reduce $\frac{10}{18}$ to a fraction of the ſame value, whoſe denominator ſhall be 262 $\frac{8}{10}$? Anſwer $\frac{146}{262}\,\frac{8}{10}$.

CASE VIII.

To reduce a mixt fraction to a ſingle one, when the numerator is the integral part.

RULE.

Firſt, Multiply it by the denominator of the fractional part, and to that product add the numerator of the fractional part for a new numerator, then multiply the denominator of the fraction by the denominator of the fractional part for a new denominator: but when the denominator is the integeral part, multiply it by the denominator of the fractional part, and to that product add the numerator of the fractional part, for a new denominator, then multiply the numerator of the fraction by the denominator of the fractional part for a new numerator.

(1) Reduce $\frac{42}{49}\frac{7}{8}$ to a ſimple fraction.

```
 42        49              343)392(1
  8         8                  343
---       ---                  ---
336       392          c.m. .49)343(7
  7       ---                    343
---                              ---
343                              ...
--- ÷ 49 = 7/8 anſwer.           ===
392
```

(2) Reduce $\frac{34}{46}\frac{1}{2}$ to a ſimple fraction? Anſwer $\frac{69}{92} = \frac{3}{4}$.

(3) Reduce $\frac{17}{43}\frac{4}{9}$ to a ſimple fraction? Anſwer $\frac{157}{387}$

(4) Reduce $\frac{73}{131}\frac{2}{3}$ to a ſimple fraction? Anſwer $\frac{5}{9}$.

(5) Reduce $\frac{41}{73}\frac{1}{4}$ to a ſimple fraction? Anſwer $\frac{164}{293}$.

(6) Reduce $\frac{7}{19}\frac{3}{5}$ to a ſimple fraction? Anſwer $\frac{5}{14}$.

CASE IX.

To reduce the fraction of one denomination to the fraction of another; but greater retaining the ſame value.

RULE.

Firſt, Reduce the given fraction to a compound fraction, by comparing it with all the denominations between it, and that denomination you would reduce it to.

Secondly, Reduce that compound fraction to a ſingle one, by caſe the fifth.

(1)

(1) Reduce $\frac{5}{6}$ of an anna to the fraction of a rupee.

$6 \times 16 = \frac{5}{96}$ Anſwer.

(2) Reduce $\frac{1}{2}$ of a pice to the fraction of a rupee. Anſr. $\frac{1}{154}$

(3) Reduce $\frac{8}{9}$ of a chahtack to the fraction of a ſeer. Anſr. $\frac{8}{144}$

(4) Reduce $\frac{6}{7}$ of a ſeer to the fraction of a maund. Anſr. $\frac{6}{280}$

(5) Reduce $\frac{9}{13}$ of a pint of wine to the fraction of a hogſhead. Anſr. $\frac{9}{6552}$

(6) Reduce $\frac{8}{12}$ of an inch to the fraction of a cubit. Anſr. $\frac{8}{216}$

CASE X.

To reduce the fraction of one denominaton to the fraction of another denomination; but leſs retaining the ſame value.

RULE.

Multiply the given numerator by the parts of the denominations between it, and that denomination you would reduce the fraction to, for a new numerator, and place it over the given denominator.

(1) Reduce $\frac{5}{96}$ of a rupee to the fraction of an anna.

$$\frac{5 \times 16 = 80}{96} \qquad \begin{array}{l} 80)96(1 \\ \underline{80} \end{array}$$

c. m. 16)80(5
80

$\frac{80}{96} \div 16 = \frac{5}{6}$ Anſr.

(2) Reduce $\frac{1}{384}$ of a rupee to the fraction of a pice. Anſr. $\frac{192}{384} = \frac{1}{2}$

(3) Reduce $\frac{8}{144}$ of a ſeer to the fraction of a chahtack. Anſr. $\frac{128}{144} = \frac{8}{9}$

(4) Reduce $\frac{6}{280}$ of a maund to the fraction of a ſeer. Anſr. $\frac{240}{280} = \frac{6}{7}$

(5) Reduce $\frac{9}{6552}$ of a hogſhead of wine to the fraction of a pint, Anſr. $\frac{4536}{6552} = \frac{9}{13}$

(6) Reduce $\frac{8}{216}$ of a cubit to the fraction af an inch. Anſr. $\frac{144}{216} = \frac{2}{3}$

CASE XI.

To find the proper quantity of a fraction in the known parts of an integer.

RULE.

Multiply the numerator by the common parts of the integer, and divide by the denominator.

(1) Reduce $\frac{2}{3}$ of a current rupee to its proper quantity.

1 c. r. = 16 a.
2

32 p.
3
rs. 10 8 Anſr.

(2)

(2) Reduce $\frac{18}{43}$ of an anna to its proper quantity. Anſr. 5a. $\frac{1}{43}$

(3) Reduce $\frac{6}{7}$ of 50 rs. 9 a. to its proper quantity. Anſr. 43 rs. 5 a. $5\frac{1}{7}$ p.

(4) Reduce $\frac{12}{78}$ of a maund to its proper quancity. Anſr. 6 ſrs. 2 chs. $\frac{36}{78}$

(5) Reduce $\frac{5}{9}$ of 100 mds. 29 ſrs. to its proper quantity. Anſr. 55 mds. 38 ſrs. 5 chs. $\frac{3}{9}$

(6) What is the proper quantity of $\frac{7}{8}$ of a cnbit? Anſr. 15 inches $\frac{6}{8}$

(7) What is the proper quantity of $\frac{4}{12}$ of 18 yds. 1 cub. 10 in.? Anſr. 6 yds. 0 cub. 9 in. $\frac{6}{12}$

(8) Reduce $\frac{18}{43}$ of a ſhilling to its proper quantity. Anſr. 5 d. $\frac{1}{43}$

(9) Reduce $\frac{6}{7}$ of 5 l. 9 s. to its proper quantity. Anſr. 4 l. 13 s. 5 d. $\frac{1}{7}$

(10) Reduce $\frac{12}{16}$ of a pound troy to its proper quantity. Anſr. 9 ounces.

(11) Reduce $\frac{12}{78}$ of a ton to its proper quantity. Anſr. 3 cwt. 0 qrs. 8 lbs. 9 oz. 13 dms $\frac{42}{78}$

(12) Reduce $\frac{5}{9}$ of a pound avoirdupois to its proper quantity. Anſr. 8 oz. 14 dms. $\frac{2}{9}$

(13) Reduce $\frac{4}{7}$ of a mile to its proper quantity. Anſr. 4 fur. 125 yds. 2 ft. 1 in. 2 b. c. $\frac{1}{7}$

(14) Reduce $\frac{9}{16}$ of a yard to its proper quantity. Anſr. 2 ft. 8 in. 1b. c. $\frac{2}{16}$

(15) Reduce $\frac{4}{3}$ of an ell Engliſh to its proper quantity. Anſr. 4 qrs. or 1 yd.

(16) Reduce $\frac{7}{16}$ of a biggah to its proper quantity. Anſr. 17 cot. 8chs.

(17)

(17) Reduce $\frac{4}{9}$ of a tun of wine to its proper quantity. Anſr. 1 hhd. 49 gals.

(18) Reduce $\frac{7}{13}$ of a day to its proper quantity. Anſr. 12 hrs. 55 mins. 23 ſec. $\frac{1}{13}$

(19) Reduce $\frac{4}{5}$ of a month to its proper quantity? Anſwer 3 wks. 1 day 9 hrs. 36 min.

(20) Reduce $\frac{7}{8}$ of a yard of cloth to its proper quantity? Anſwer 3 qrs. 2 nls.

CASE XII.

To reduce any given quantity to the fraction of any greater denomination of the ſame kind.

RULE.

Firſt, Reduce the given quantity to the loweſt mentioned term for a numerator.

Secondly, Reduce the integral parts to the ſame term for a denominator, and that will be the fraction required.

Note, If there be a fraction given with the ſaid quantity, let it be put to the numerator of the fraction required.

(1) Reduce 10a. 8p. to the fraction of a current rupee?

1r. = 16a.
12
dr. 192

10a. 8p.
12
nr. 128)192(1
128
c. m. 64)128(2
128
. . .

$\frac{128}{192} \div 64 = \frac{2}{3}$ anſwer.

(2) Reduce 5p. $\frac{1}{43}$ to the fraction of an anna? Anſwer $\frac{18}{43}$.

(3) What part of 50rs. 9a. is 43rs. 5a. 5p. $\frac{1}{7}$? Anſwer $\frac{6}{7}$.

(4) Reduce 6ſrs. 2chs. $\frac{36}{78}$ to the fraction of a maund? Anſwer $\frac{12}{78}$.

(5) What part of 100 mds. 29 ſrs is 55 mds. 38 ſrs. 5 chs. $\frac{3}{9}$? Anſwer $\frac{5}{9}$.

(6) Reduce 15 in. $\frac{6}{8}$ to the fraction of a cubit? Anſwer $\frac{7}{8}$.

(7) What part of 18 yds. 1 cub. 10 in. is 6 yds. 0cub. 9 in.? Anſwer $\frac{4}{12}$.

(8) Reduce 5d. $\frac{1}{43}$ to the fraction of a ſhilling? Anſwer $\frac{18}{43}$.

(9) What part of 5l. 9s. is 4l. 13s. 5d. $\frac{1}{7}$? Anſwer $\frac{6}{7}$.

(10) Reduce 9 oz. Troy to the fraction of a lb.? Anſwer $\frac{3}{4}$.

(11) Reduce 3cwt. 0qrs. 8lbs. 9oz. 13dms. $\frac{42}{78}$ to the fraction of a ton? Anſwer $\frac{12}{78}$.

12) Reduce 8 oz. 14 dms. $\frac{2}{9}$ to the fraction of a lb. avoirdupois? Anſwer $\frac{5}{9}$.

(13)

(13) Reduce 4 fur. 125 yds. 2 ft. 1 in. 2 b.c. $\frac{1}{7}$ to the fraction of a mile? Anſwer $\frac{4}{7}$.

(14) Reduce 2ft. 8in. 1b.c. $\frac{2}{10}$ to the fraction of a yard? Anſwer $\frac{9}{10}$.

(15) Reduce 1yd. to the fraction of an ell? Anſwer $\frac{4}{5}$.

(16) Reduce 17 cot. 8 chs. to the fraction of a biggah. Anſwer $\frac{7}{8}$.

(17) Reduce 1hhd. 49gals. of wine to the fraction of a tun. Anſwer $\frac{4}{9}$.

(18) Reduce 12hrs. 55min. 23ſec. $\frac{1}{13}$ to the fraction of a day natural. Anſwer $\frac{7}{13}$.

(19) Reduce 3wks. 1d. 9hrs. 36min. to the fraction of a month. Anſwer $\frac{4}{5}$.

(20) Reduce 3qrs. 2nls. to the fraction of a yard. Anſwer $\frac{7}{8}$.

Addition of Vulgar Fractions.

CASE I.

TO add vulgar fractions, when they are compoſed of mixed numbers, or compound fractions.

RULE.

Firſt, Reduce the mixed number to an improper fraction, and a compound fraction to a ſingle fraction.

Secondly, Reduce thoſe fractions to a common denominator; then add all the numerators together for a new numerator, under which ſubſcribe the common denominator.

Prove theſe ſums by ſubſtraction.

(1) Add $\frac{1}{2}$ and $\frac{7}{8}$ together

$$\begin{array}{l} 1 \times 8 = 8 \\ 2 \times 7 = 14 \\ \hline \underline{\underline{22}} \text{ new numeratos.} \end{array}$$

$$2 \times 8 = 16 \text{ common denominator.}$$

$$16\overline{)\ 22\ }$$

$$\underline{\underline{1}}\ \tfrac{6}{16} \text{ Anſwer.}$$

(2) Add $\frac{7}{10}$ $\frac{11}{12}$ and $\frac{4}{9}$ together. Anſwer $2\frac{66}{1080}$.

(3) Add 19 and $7\frac{1}{2}$ of $\frac{2}{3}$ together. Anſwer $26\frac{1}{6}$.

(4) Add $\frac{1}{2}$ of $\frac{7}{8}$ and $\frac{2}{3}$ of $\frac{19}{20}$ together. Anſwer $1\frac{68}{960}$.

(5) Add $\frac{1}{3}$ of 95 and $\frac{7}{8}$ of 14 together. Anſwer $43\frac{22}{24}$.

(6) Add $\frac{2}{3}$ and $17\frac{1}{2}$ together. Anſwer $18\frac{1}{6}$.

(1) Add $12\frac{1}{2}$ and $3\frac{2}{3}$ and $4\frac{3}{4}$ together. Anſwe $20\frac{22}{24}$.

(3) Add $6\frac{7}{8}$ of $\frac{9}{10}$ and $\frac{4}{7}$ of $\frac{1}{2}$ and $7\frac{1}{2}$ together, Anſwer $1\frac{1284}{2240}$.

CASE II,

When the fractions are compoſed of different denominations.

RULE I.

Reduce them to their proper quantities by Caſe the 11th in Reduction, then add them as in Addition of Whole Numbers.

RULE II.

Reduce the fractions to one denomination by Caſe the 9th or 10th in Reduction, then reduce thoſe fractions to a common denominator, and proceed as in Caſe the 1ſt of Addition, which will produce the anſwer in the known parts of the integer.

(1) Add $\frac{12}{18}$ of a rupee to $\frac{3}{4}$ of an anna?

By rule the 1ſt.

1r. = 16a.
12
18) 192
10a. 8p.

1a. = 12p.
3
4) 36
9p.

10 a. 8 p. + 9 p. = 11 a. 5 p. Anſr.

By rule the ſecond, and caſe the ninth in reduction,

$\frac{12}{18}$ $\qquad$ $\frac{3}{4 \times 16 = 64}$

$$\left.\begin{array}{r} 12 \times 64 = 768 \\ 3 \times 18 = \underline{\;\;54} \\ 822 \end{array}\right\}\text{ new numerators}$$

$64 \times 18 = 1152$ common denominator

$$\frac{822 \times 16}{1152} = 11\text{ a. } 5\text{ p. Anſr.}$$

By rule the ſecond, and caſe the tenth in reduction.

$$12 \times 16 = \frac{192}{18} \quad \frac{3}{4}$$

$$\left.\begin{array}{r} 192 \times 4 = 768 \\ 3 \times 18 = \underline{\ \ 54} \\ \underline{822} \end{array}\right\} \text{new numeratars}$$

$4 \times 18 = 72$

72)822(11 a. 5 p. Anſr.

(2) Add $\frac{3}{8}$ of an anna to $\frac{2}{8}$ of a rupee. Anſr. 4a. 4p. $\frac{1}{2}$

(3) Add $\frac{1}{2}$ of a maund to $\frac{3}{12}$ of a ſeer. Anſr. 20 ſrs. 4 chs.

(4) Add $\frac{4}{7}$ of a ton to $\frac{9}{10}$ of an cwt. Anſr. 12 cwt. 1 qr. 8 lbs. 12 oz. 12 dms. $\frac{8}{10}$

(5) Add $\frac{3}{4}$ of a mile to $\frac{7}{10}$ of a furlong. Anſr. 6 fur. 28 pol.

(6) Add $\frac{1}{2}$ of a yard to $\frac{2}{3}$ of a foot. Anſr. 2 f. 2 in.

(7) Add $\frac{1}{3}$ of a day to $\frac{1}{2}$ of an hour. Anſr. 8hrs. 30m.

(8) Add $\frac{3}{4}$ of a cottah to $\frac{5}{9}$ of a biggah. Anſr. 22 cot. 15 big. $\frac{5}{9}$

(9) Add $\frac{1}{3}$ of a week, $\frac{1}{4}$ of a day, and $\frac{1}{2}$ of an hour together. Anſr. 2 ds. 14 hrs. 30 min.

(10) Add $\frac{2}{3}$ of a yard, $\frac{3}{4}$ of a foot, and $\frac{7}{8}$ of a mile together. Anſr. 1540 yds. 2 ft. 9 in.

(11) Add $\frac{7}{8}$ of a pound to $\frac{3}{4}$ of a ſhilling. Anſr. 18 s. 3 d.

(12) Add $\frac{2}{4}$ of an anna to $\frac{1}{9}$ of a gold-mohur. Anſr. 1 r. 13 a. 2 p. $\frac{3}{9}$

(13) Add $\frac{4}{7}$ of a maund to $\frac{9}{10}$ of a ſeer. Anſr. 23 ſrs. 12 chs. $\frac{8}{70}$

(14) Add $\frac{}{2}$ of a yard to $\frac{2}{3}$ of a cubit. Anſr. 1 cub. 12 in.

Subſtraction of Vulgar Fractions.

CASE I.

To ſubſtract vulgar fractions, when compoſed of mixed numbers or compound fractions.

RULE.

Firſt, Prepare them as directed in Addition, until reduced to a common denominator, then ſubſtract the leſs number from the greater, and place that difference over the common denominator; but when the lower fraction is greater than the upper, ſubſtract the numerator of the lower fraction from the denominator, and to that difference add the upper numerator carrying one to the units place of the lower whole number.

(1) From $\frac{111}{112}$ take $\frac{3}{4}$.

$$\begin{array}{rl} \left.\begin{array}{r} 111 \times 4 = 444 \\ 112 \times 3 = \underline{336} \end{array}\right\} & \text{nrs.} \\ \overline{108} & \text{nr.} \\ \overline{} & \text{Anſr.} \\ 112 \times 4 = \underline{\underline{448}} & \text{dr.} \end{array}$$

(2) From $\frac{97}{100}$ take $\frac{3}{7}$. Anſr. $= \frac{379}{700}$.

(3) From $96\frac{1}{3}$ take $14\frac{3}{7}$. Anſwer $= 81\,\frac{19}{21}$

(4) From 96 take $\frac{3}{5}$. Anſwer $95\frac{2}{5}$.

(5) From $\frac{1}{3}$ of 76 take $\frac{3}{4}$ of 21. Anſr. $9\,\frac{7}{12}$.

(6) From $\frac{109}{110}$ take $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$. Anſr. $\frac{1956}{2640}$.

(7) From $71\,\frac{1}{2}$ take $\frac{17}{19}$. Anſr. $70\,\frac{23}{38}$.

(8) From $14\,\frac{1}{4}$ take $\frac{2}{3}$ of 19. Anſr. $1\,\frac{7}{12}$.

CASE

CASE II.

When the fractions are compoſed of different denominations.

RULE. I.

Reduce them to their proper quantities by Caſe the 11th in Reduction, then ſubſtract them as in Subſtraction of Whole Numbers.

RULE II.

Reduce the fractions by Caſe the 9th or 10th in Reduction, then reduce thoſe fractions to a common denominator. and proceed as in Caſe the 1ſt of Subſtraction, which will produce the anſwer in the known parts of the integer.

(1) From $\frac{137}{192}$ of a rupee take $\frac{3}{4}$ of an anna.

By Rule the 1ſt.

$$\frac{137 \times 16}{192} = 11\text{a. } 5\text{p.} \qquad \frac{3 \times 12}{4} = 9\text{ p.}$$

$$11\text{a. } 5\text{p.} - 9\text{p.} = 10\text{a. } 8\text{p. Anſr.}$$

By Rule the 2d and Caſe the 9th in Reduction.

$$\frac{137}{192} \qquad \frac{3}{\overline{4 \times 16 = 64}}$$

$$\left.\begin{array}{r} 137 \times 64 = 8768 \\ 192 \times 3 = \underline{576} \end{array}\right\}\text{nrs.}$$

$$\begin{array}{r} 8192 \\ \hline \end{array}$$

$$192 \times 64 = 12288$$

$$\frac{8192 \times 16}{12288} = 10\text{a. } 8\text{p. Anſr.}$$

By Rule the 2d and Caſe the 10th in Reduction.

$$137 \times 16 = \frac{2192}{192} \qquad \frac{3}{4}$$

$$\left.\begin{array}{r} 2192 \times 4 = 8768 \\ 3 \times 192 = 576 \end{array}\right\} \text{qrs.}$$

$$\overline{8192 \text{ dr.}}$$

$$192 \times 4 = 763$$

768)8192(10a. 8p. Anſr.

(2) From $\frac{1}{2}$ of a gold-mohur take $\frac{3}{9}$ of an anna. Anſwer 7 rs. 15 a. 3 p.

(3) From $\frac{2}{5}$ of a maund take $\frac{7}{8}$ of a ſeer. Anſwer 15 ſrs. 2 chs.

(4) From $\frac{1}{2}$ of an cwt. take $\frac{7}{12}$ of a pound. Anſwer 1 qr. 27 lb. 6 oz. 10 dwt. $\frac{8}{12}$

(5) From $\frac{2}{3}$ of a league take $\frac{7}{10}$ of a mile. Anſwer 1 m. 2 fur. 16 pol.

(6) From 1 ell take $\frac{7}{10}$ of a quarter. Anſwer 1 yd. 0 qrs. 1 in. $\frac{2}{10}$

(7) From $\frac{3}{12}$ of a pipe of wine take a gallon. Anſwer 30 gals. 2 qts.

(8) From $\frac{4}{8}$ of a biggah take $\frac{2}{3}$ of a cottah. Anſwer 19 cot. 5 chs. $\frac{1}{3}$

(9) From 7 weeks take 9 days $\frac{7}{10}$. Anſwer 5 wks. 4 ds. 7 hrs. 12 min.

(10) From 4 days $7\frac{1}{2}$ hours take 1 day 9 hours $\frac{3}{18}$. Anſwer 2 ds. 22 hrs 20 min.

(11) From $\frac{1}{2}$ of a rupee take $\frac{3}{4}$ of an anna. Anſwer 7 a. 3 p.

(12) From $\frac{1}{4}$ of 20 rupees take the $\frac{5}{8}$ of 2 rs. 8 a. Anſwer 3 rs. 7 a.

(13)

(13) From $\frac{2}{8}$ of 5 maunds take $\frac{7}{8}$ of 2 ſeers. Anſwer 1 md. 8 ſrs. 4 chs.

(14) From $\frac{3}{4}$ of a yard take $\frac{5}{9}$ of a cubit. Anſwer 1 ft. 5 ins.

Multiplication of Vulgar Fractions

RULE.

REDUCE compound fractions to ſimple fractions, and mixt numbers to improper fractions; then multiply all the numerators together for a new numerator, and all the denominators together for a new denominator; which products give the anſwer.

Note. When any number, either whole or mixed, is multiplied by a fraction, the product is always leſs than the multiplicand, in the ſame proportion as the multiplying fraction is leſs than 1, or a unit.

(1) Multiply $\frac{3}{7}$ by $\frac{3}{11}$

$$\left.\begin{array}{r} 3 \times 3 = 9 \\ \overline{} \\ 7 \times 11 = 77 \end{array}\right\} \text{Anſwer.}$$

(2) Multiply $\frac{4}{8}$ by $\frac{7}{9}$. Anſr. $\frac{28}{72}$.

(3) Multiply $\frac{1}{3}$ of $\frac{4}{5}$ by $\frac{7}{10}$ of $\frac{11}{12}$. Anſr. $\frac{308}{1800}$.

(4) Multiply $7\frac{1}{4}$ by $8\frac{1}{2}$. Anſr. $61\frac{5}{8}$.

(5) Multiply $4\frac{1}{2}$ by $\frac{1}{5}$. Anſr. $\frac{9}{10}$.

(6)

(6) Multiply $\frac{7}{8}$ by 13 $\frac{9}{10}$. Anſr. 12 $\frac{13}{80}$.
(7) Multiply $\frac{1}{2}$ of 7 by $\frac{3}{6}$. Anſr. 1 $\frac{9}{12}$.
(8) Multiply $\frac{3}{5}$ of 8 by $\frac{7}{8}$ of 5. Anſr. 21.
(9) Multiply $\frac{3}{6}$ by $\frac{4}{9}$ of 11. Anſr. 2 $\frac{24}{54}$.
(10) Multiply $\frac{4}{5}$ of 91 by 71 $\frac{1}{2}$. Anſr. 5205 $\frac{2}{10}$.
(11) Multiply 12 $\frac{3}{5}$ by $\frac{2}{6}$ of 7. Anſr. 29 $\frac{12}{30}$.
(12) Multiply 7 $\frac{1}{2}$ by 9 $\frac{1}{4}$. Anſr. 69 $\frac{3}{8}$.

Diviſion of Vulgar Fractions.

RULE.

PREPARE the fractions as in Multiplication, then multiply the numerator of the diviſor into the denominator of the dividend for a denominator, and the denominator of the diviſor into the numerator of the dividend for a numerator; or which is the ſame, invert the terms of the diviſor, then multiply the upper terms together, and the lower terms together (as in multiplication) for the anſwer.

Note, when the dividend is greater than the diviſor, the quotient will be greater than the dividend; but when the dividend is leſs than the diviſor, then the quotient will be leſs than the dividend, and in the ſame proportion as an unit is greater, or leſs than the dividing fraction.

(1) Divide $\frac{17}{21}$ by $\frac{3}{5}$.

$5 \times 17 = 85$ 63)85(1 $\frac{22}{63}$ Anſr.
$3 \times 21 = 63$ 63
22

(2) Divide $\frac{13}{19}$ by $\frac{7}{9}$. Anſr. $\frac{117}{133}$

(3) Divide $\frac{14}{18}$ by $\frac{7}{10}$. Anſr. $1\frac{14}{126}$.

(4) Divide $1\frac{1}{2}$ by $4\frac{8}{10}$. Anſr. $\frac{30}{96}$.

(5) Divide $\frac{7}{8}$ by 4. Anſr. $\frac{7}{32}$.

(6) Divide 4 by $\frac{7}{8}$. Anſr. $4\frac{4}{7}$.

(7) Divide 99 by 108. Anſr. $\frac{99}{108}$.

(8) Divide $\frac{1}{5}$ of 19 by $\frac{2}{3}$ of $\frac{3}{4}$. Anſr. $7\frac{18}{30}$.

(9) Divide $\frac{2}{2}$ of $\frac{2}{3}$ by $\frac{2}{3}$ of $\frac{3}{4}$. Anſr. $\frac{24}{36}$.

(10) Divide $\frac{}{3}$ of $\frac{3}{4}$ by $\frac{1}{2}$ of $\frac{2}{3}$. Anſr. $1\frac{12}{24}$.

(11) Divide $4\frac{5}{9}$ by $\frac{5}{9}$ of 4. Anſr. $2\frac{1}{20}$.

(12) Divide $\frac{5}{9}$ of 4 by $4\frac{5}{9}$. Anſr. $\frac{22}{42}$.

Of the Single Rule of Three

IN VULGAR FRACTIONS.

RULE.

HAVING ſtated the terms according to the rule laid down in Whole Numbers, and reduced each term (if neceſſary) to a ſingle or improper fraction, invert the firſt term, then multiply the three numerators together, and the three denominators together for the numerator and denominator of the anſwer. (which is the ſame as multiplying the ſecond and third terms together, and dividing the product by the firſt) The anſwer will then be of the ſame denomination, as the ſecond term, which reduce to its proper quantity, if required.

(1)

(1) If $\frac{11}{13}$ of a ſeer of ſugar coſt $\frac{7}{15}$ of a rupee, what coſt $\frac{32}{43}$ ſeer?

$$\frac{11}{13} : \frac{7}{15} :: \frac{32}{43} : \frac{2912}{7095}$$

$$13 \times 7 \times 32 = 2912$$

$$11 \times 15 \times 43 = 7095$$

```
        2912
          16
      ------
7095)46592(6 a.  6 p. 5694/7095  Anſr.
     42570
     -----
      4022
        12
     -----
7095)48264(6 p.
     42570
     -----
      5694
     -----
      7095
```

(2) If $\frac{3}{5}$ of an ell coſt $\frac{2}{3}$ of a rupee, what coſt $\frac{12}{17}$ of an ell? Anſr. 12 a. 6 p. $\frac{10}{17}$.

(3) If $\frac{4}{7}$ of a cubit coſt $\frac{11}{13}$ of a rupee what coſt 1 cubit? Anſr. 1 r. 7 a. 8 p. $\frac{4}{13}$.

(4) If $3\frac{1}{4}$ yards of cloth, that is $1\frac{1}{5}$ yard wide, be ſufficient to make a cloak, how much muſt I have of that ſort, which is $\frac{4}{5}$ of a yard wide to make a cloak of the ſame bigneſs? Anſr. $4\frac{7}{8}$ yards.

(5) If 3 oz. of ſilver coſt 16 rs. 5 a. what coſt $\frac{3}{4}$ of an ounce? Anſr. 4 rs. 1 a. 3 p.

(6) If $6\frac{1}{2}$ yards coſt 18 rupees what coſt $9\frac{1}{4}$ yards? Anſr. 25 rs. 9 a. 10 p. $\frac{2}{13}$.

(7)

(7) If a dollar be worth $33\frac{3}{5}$ annas, what are 500 dollars worth? Anſr. 1050 rupees.

(8) If 16 men finiſh a piece of work in $28\frac{1}{3}$ days, how long will 12 men require to do the ſame work? Anſr. $37\frac{7}{9}$ days.

(9) If $1\frac{1}{4}$ cubit coſt 9 annas, what coſt $16\frac{1}{4}$ cubits? Anſr. 7 rs. 5a.

(10) If 1 pagoda be worth $3\frac{5}{8}$ ſ. rs. what are 100 pagodas worth? Anſr. $362\frac{4}{8}$ rupees.

(11) If $\frac{5}{7}$ of a ſeer coſt $\frac{11}{12}$ of a rupee, what coſt 1 ſeer? Anſr. 1 r. 4 a. $6\frac{2}{5}$ p.

(12) If $1\frac{1}{4}$ yards in breadth require $20\frac{1}{2}$ yards long to make a garment, what length will $\frac{3}{4}$ of a yard wide require to make the ſame? Anſr. $34\frac{1}{6}$ yards.

(13) If a mug of ſilver weigh $46\frac{11}{15}$ ſ rs. what is its worth at $1\frac{5}{16}$ r. per ſr. Anſr. 61 rs. 5 a. $4\frac{4}{5}$ p.

(14) If $\frac{9}{10}$ of a maund coſt 14 rs. 4 a. what will $7\frac{1}{2}$ maunds coſt? Anſr. 118 rs. 12 a.

(15) If $\frac{3}{5}$ of a cubit coſt $\frac{2}{3}$ of 19 annas, what coſt 7 cubits? Anſr. 9 rs. 3 a. $9\frac{1}{3}$ p.

(16) How many pieces of merchandize at $20\frac{1}{8}$ rupees per piece, are to be given for 240 pieces $\frac{1}{7}$ at $12\frac{1}{2}$ rupees per piece? Anſr. $149\frac{177}{1127}$ rupees.

(17) If 8 chahtacks of iſinglaſs coſt 4 a. 9 p. $\frac{3}{5}$ what coſt 1 chahtack? Anſr. $7\frac{1}{5}$ pice.

(18) If 1 yard of broad cloth coſt $15\frac{5}{8}$ rupees, what will 4 pieces each containing 27 yards $\frac{3}{8}$ coſt? Anſr. 1710 rs. 15 a.

(19) A mercer bought $3\frac{1}{2}$ pieces of ſilk each containing $24\frac{1}{}$[illegible] cubits at 6 annas per cubit, I demand th

value of the 3^{1} pieces at that rate? Anſr. 31 rs. 15a.

(20) How many yards of canvas that is $1\frac{1}{4}$ wide wil be ſufficient to line 20 yards of ſay, that is $\frac{3}{4}$ of a yard wide? Anſr. 12 yards.

(21) A merchant had $5\frac{3}{5}$ maunds of ſugar at $6\frac{1}{4}$ rupees per maund, which he will barter for tea at $3\frac{1}{8}$ rupees per ſeer, I demand how much tea muſt be given for the ſugar? Anſr. 12 ſrs. 11 chs. $\frac{3}{25}$.

(22) Bought 120 ſeers of tea at $3\frac{5}{8}$ rupees per ſeer, and ſold it for 470 rupees, what was the gain or loſs per cent? Anſr. $8\frac{4}{87}$ rupees.

Of the Double Rule of Three

IN VULGAR FRACTIONS.

RULE.

PROCEED according to the rule laid down in Whole Numbers for ſtating the queſtion, and prepare the terms, as directed in the Single Rule of Three in Vulgar Fractions.

(1) If 9 people ſpend $100\frac{7}{9}$ rupees in 18 days, how much will 20 people ſpend in 30 days at the ſame rate?

$$\frac{9}{1} : 100\frac{7}{9}\text{ rs.} :: \frac{20}{1} : \frac{18}{1}\frac{40}{1}$$

$$\begin{array}{c} 9 \\ \hline 907 \\ \hline 9 \end{array}$$

thus

$$\text{thus}\begin{cases}1 \times 907 \times 20 = \dfrac{18140}{81} \\ 9 \times 9 \times 1 = 81\end{cases}$$

$$\frac{18}{1} : \frac{18140}{81} :: \frac{30}{1}$$

$$\frac{1 \times 18140 \times 30 = 544200}{18 \times 81 \times 1 = 1458} \quad \text{Anſr.}$$

PROOF.

$$\begin{array}{llllllll} & \text{pl.} & \text{ds.} & \text{rs.} & & \text{pl.} & \text{ds.} & \text{rs.} \\ \text{If} & 9 \times & 18 :: & 100\frac{7}{9} & : & 20 \times & 30 : & \frac{544200}{1458} \\ & & \underline{9} & \underline{9} & & & \underline{20} & \\ & & \underline{162} & \underline{907} & & & \underline{\underline{600}} & \\ & & 1 & 9 & & & & \end{array}$$

$$\frac{\text{thus } 1 \times 907 \times 600 = 544200}{162 \times 9 \times 1 = 1458}$$

$$\begin{array}{r} 1458)544200(373\text{rs.} \\ \underline{4374} \\ 10680 \\ \underline{10206} \\ 4740 \\ \underline{4374} \\ 366 \\ \underline{16} \\ 1458)5856(4\text{a} \end{array}$$

1458

```
1458)5832(4a
     5832
     ----
       24
     ----
  24)1458(60
     144
     ----
       18)24(1
          18
          --
c. m.   6)18(3
          18
          --
          ..
```

$\frac{24}{1458} \div 6 \quad \frac{4}{243}$ $=$

Anſr. 373 rs. 4 a. $\frac{4}{243}$.

(2) Three men having worked $19\frac{1}{2}$ days received $8\frac{9}{10}$ rupees how much muſt 20 men have for 100 days and a quarter? Anſr. 305 rs. 0 a. 6 p. $\frac{22}{39}$.

(3) A man and his wife having laboured 1 day earned $4\frac{5}{8}$ rupees I demand how much they muſt have for $10\frac{1}{2}$ days when their two ſons helped them? Anſr. 97 rs. 2 a

(4) A man with his family, which in all were 15 perſons did uſually expend $7\frac{4}{5}$ maunds of rice in a week how much will be expended in $22\frac{1}{2}$ weeks when 7 perſons leave the family? Anſr. 93 mds. 24 ſrs.

(5) Seven men with their wives upon examining into their expences for 20 weeks paſt found that they had laid out $40\frac{3}{8}$ rupees. I demand in what time $28\frac{3}{7}$ rupees may be ſpent by 46 men in the like proportion? Anſr. 3 wks, $\frac{4151}{32003}$.

(6)

(6) Three ſailors having been abroad $9\frac{1}{4}$ months received $40\frac{3}{5}$ rupees. I demand how much 100 ſailors muſt receive for 28 months $\frac{3}{7}$ ſervice? Anſr. 4118 rs. 4 a. 9 p. $\frac{273}{259}$.

DECIMAL FRACTIONS.

NOTATION.

THE word Decimal is derived from Decem (ten) and denotes the nature of its numbers; becauſe the integer, or whole thing, whether it be coin, weight, meaſure, time, &c. is ſuppoſed to be divided into ten equal parts, and every one of theſe parts, into ten other equal parts, &c. *ad infinitum.*

The integer being thus divided by imagination into 10, 100, 1000, 10000, &c. is the denominator to the decimal fraction.

Thus $\frac{3}{10}$ $\frac{5}{100}$ $\frac{17}{1000}$ $\frac{51}{10000}$ &c.

Theſe denominators are ſeldom or never ſet down, but only the numerators, andwhen the numerators do not conſiſt of ſo many places, as the denominator has cyphers, the ſaid place in the numerator muſt be ſupplied by cyphers prefixed on the left hand. So $\frac{}{10}$ is wrote .3 $\frac{5}{100}$ is .05 $\frac{17}{1000}$ is .017 and $\frac{51}{10000}$ is .0051 &c.

Alſo mixed numbers are expreſſed thus, viz. 8.7 is 8 and 7 tenths, 59.017 is 59 and 17 thouſandths, or parts of a thouſand. Cyphers at the right hand of a decimal do neither augment or diminiſh its value; for .5 .50 .500 .5000 and .50000 are decimals having the ſame value, being each equal to ½, as may be found by Abbreviation of Vulgar Fractions. Cyphers prefixed to decimals decreaſe their value in a tenfold proportion by removing them further from the integer.

thus
.5=tenth parts.
.05=parts of an hundred.
.005=parts of a thouſand.
.0005=parts of ten thouſand.
.00005=parts of an hundred thouſand, &c.

In Whole Numbers the firſt place above (that is on the left hand of) the place of units ſignifies tens of units; but in fractions the firſt place beneath (that is on the right hand of) the place of units, denotes tenth parts of 1, or unity, and is called the firſt place of decimal parts, or place of primes; likewiſe the ſecond place above the place of units ſignifies hundreds of units; but the ſecond place beneath the place of units expreſſes hundredth parts of unity, and is called the ſecond place of decimals, or place of ſeconds; and that as the value of the places in integers aſcend in a tenfold proportion from the place of units towards the left hand, ſo the value of the places of decimals deſcend in a tenfold proportion beneath the place of units towards the right hand.

A

A Table for Notation of Integers and Decimals.

Figure	Place
8	Hundreds of thouſands.
7	Tens of thouſands.
2	Thouſands.
3	Hundreds.
6	Tens.
5	Units place.
.	
8	Tenths.
2	Hundred parts.
3	Thouſandth parts.
5	Parts of ten thouſands.
3	Parts of an hundred thouſands.
7	Parts of a million.
8	Parts of ten millions.
5	Parts of an hundred millions.

It may be obſerved by the foregoing table, that the places of integers or whole numbers are ſeparated from the decimal parts by a point: that the numbers on the left hand of the point expreſs 872365 integers or units, and that the numbers on the right hand of the point ſhews .82353785 parts of 1, (or an integer) ſuppoſed to be divided into 100000000 equal parts. Hence if the ſeparating point in any mixed, or fractional number be moved one place towards the left hand, then every figure, and conſequently the whole expreſſion is but a tenth part of what it was before, that is, it is divided by 10: if it be moved two places it is divided by 100: if three places by 1000, &c. but if the ſeparating point be moved towards the right hand, then the whole expreſſion is multiplied by 10, 100. 1000, &c. according as it is moved one, two or three places. There are ſeveral ways of reading or expreſſing a decimal, as ſuppoſing the decimal parts in the table were to be read in words, viz. .82353785.

Firſt. They may be reduced to, and expreſs as Vulgar Fractions.

viz. $\frac{82353785}{100000000}$.

Secondly. By calling them primes, ſeconds, &c. according to their diſtance from the ſeparating point, viz. 8 primes, 2 ſeconds, 3 thirds 5 fourths, 3 fifths, 7 ſixths, 8 ſevenths, and 5 eighths.

Thirdly. Thus, 82 millions, 353 thouſands, 785 eighths.

Fourthly. Or thus, 8, 2, 3, 5, 3, 7, 8, 5 of a decimal.

ADDITION of DECIMALS.

WHEN Decimal Fractions are to be added together, obſerve that the commas, or ſeparating points in each expreſſion, be placed directly underneath each other; for then prime's, ſecond's third's, &c. will fall under thoſe of the ſame name; and in mixed numbers, units will fall under units, tens under tens, &c.

RULE

RULE.

Add as in whole numbers, and from the ſum or difference, cut off ſo many places for decimals, as are equal to the greateſt number of decimal places in any of the given numbers.

(1) Rupees	(2) Annas	(3) Pice
14.471	47.4	7004.16
1.191	19.71	712.712
1.8126	461.721	19.0174
3.6125	400.004	7.3126
7.1281	7.1004	71.1851
18.8126	7.07	3.108
47.0279	943.0054	7817.4051

(4) Maunds	(5) Seers	(6) Chahtacks
71.001	41.8102	861.18104
120.07	140.037	3.14
31.121	18.10	1.181
13.4101	7.8141	7.7121
75.94	16.4612	8.19817
7.3	7.81	13.071
319.8421	232.0325	894.48331

(7) Let 3746+137.5+1.347+375+1.85+.0736285 +87395.4+8.7386429+127+5.275 be added together. Anſr. 88053.5588714.

SUBSTRACTION of DECIMALS.

RULE.

HAVING firſt ſet down the greater of the two numbers given (whether it be a whole number, mixed number, or a decimal) ſet down the leſs under it, according to the directions given in Addition, then ſubſtract as in whole numbers, imagining all the vacant places filled with cyphers,

(1) From 924.65
take 78.0045
846.6455

(2) 80.25908
7.0795
73.17958

(3) 375.5 — 86.47284 = 289.02716

(4) 87.569245 — 19.87 = 67.699245

(5) 1. — .732594 = .267406

(6) 684.—9.3275 =674.6725

(7) 1081.761—10.00012 = 1071.76088

(8) 761.8109—18.9112 = 742.8997

(9) Let 375.5 be diminiſhed, or made leſs by .97637387 and ſhew their difference. Anſr. 374.52362613

Mul-

Multiplication of Decimals.

CASE I.

WHEN both factors are finite decimals, whether they be pure, or joined with integers.

RULE.

Multiply them as if they were all whole numbers, and from the product (towards the right hand) cut off ſo many places for decimal parts in the product, as there are in both the multiplier and multiplicand counted together. But if it ſo happens, that there are not ſo many places in the product, ſupply the defect by prefixing cyphers.

Multiply .612 by 4.12
4.12
7314
2448
2.32144

(2) .9746
.0259
87714
48730
9492
.01524214

	multiplicands.	multipliers.	products.
(3)	.48	× 48	= 23.04
(4)	37.9	× 46.5	= 1762.35
(5)	.121	× 17.2	= 2.0812
(6)	1.81	× 71.	= 128.51

multiplicands.	mulitipliers.	products.
(7) 4.1	× 1.42	= 5.822
(8) .0071	× .121	= .0008591
(9) .0041	× .00017	= .000000697
(10) .0027	× 41.	= .1107
(11) 410.	× .0012	= .4920
(12) .07	× .07	= .0049
(13) .1007	× .41	= .041287
(14) 4.001	× .004	= .016004

CASE II.

Two decimal fractions being given to reſerve in their product a number of places.

RULE.

Set the units place of the multiplier directly under that figure of the decimal part of the multiplicand, whoſe place you would reſerve in the product, and invert the order of all its other places, that is write the decimals on the left hand, and the integers, if any, on the right.

Then in multiplying, always begin at that figure of the multiplicand, which ſtands over the figure of each particular product directly underneath one another, due regard being had to the increaſe, which would ariſe out of the two next figures to the right hand of that figure in the multiplicand, which you then begin with: carry one from 5 to 15, two from 15 to 25, three from 25 to 35, &c. and the ſum of theſe lines will give the product.

(1)

(1) Let 73.8429753 be multiplied into 4.628754, reſerving only 5 places of decimal parts in the product.

73.8429753	The work		73.8429753
4.578264	at large.		4.628754
29537190		29	53719012
4430579		369	2148765
147686		5169	008271
59074		59074	38024
5169		147685	9506
369		4430578	518
30		29537190	12
341.80097		341.80096	72917762

(2) Let 843.7527 be multiplied into 8634.875 reſerving only the integers in the product. Anſr. 7285699. or 7285699.0954125.

(3) Multiply 384.672158 by 36.8345 ſo as to have only four decimal places in the product. Anſr. 14169.2065.

(4) Multiply 3.141592 by 52.7438 ſo as to have only four decimal places in the product. Anſr. 165.6995.

DIVISION of DECIMALS.

IN any of the following caſes in diviſion, if the dividend be greater than the diviſor, the quotient will be either a whole, or a mixt number; but when the dividend is leſs than the diviſor, the quotient muſt neceſſarily be a fraction: for a leſs number is contained in a greater once at the leaſt; but the greater is not contained once in the leſs.

CASE I.

When the diviſor, and dividend are both finite decimals.

RULE.

Divide as in whole numbers, and from the right hand of the quotient point off for decimals ſo many places as the decimal places in the dividend exceed thoſe in the diviſor, and thoſe to the left, if any, are integers; but if the places of the quotient are not ſo many, as this rule requires, ſupply the defect by prefixing cyphers to the quotient; but if the decimal places in the diviſor are more than thoſe in the dividend, annex cyphers to the dividend to make them equal, and the quotient will be integers until all thoſe cyphers are uſed. Whenever you have a remainder annex the ſign + to the right of the quotient.

	diviſors.		dividends.		quotients or anſwers.
(1)	87.364	÷	714.025972	=	8.173
(2)	.179	÷	.48624097	=	.00271643
(3)	8.45	÷	295.75	=	35.
(4)	.7563	÷	59062.4922	=	78094.
(5)	.0078	÷	4368.	=	560000
(6)	24.3	÷	780.516	=	32.12
(7)	.7875	÷	441.	=	560.

(8)

(8) 5.73) 2.580219 (.4503
(9) .534) .30438 (.57
(10) 436.) 34246.056 (78.546
(11) 25.324) 237.34691084 (9.37241
(12) .784) .281456 (.000359
(13) 7.84) 28.1456 (3.59

CASE II.

To contract the work of diviſion, when the diviſor conſiſts of many decimal places.

RULE.

Having determined the value of the quotient figures, let each remainder be a new dividend, and for every ſuch dividend point off one figure from the right hand of the diviſor, obſerving at each multiplication to have regard to the increaſe of the figures ſo cut off, as in contracted Multiplication.

```
1)   384.672158)14169.2066038510(36.8345
        ......  1154016474
                ----------
                2629041863
                2308032943
                ----------
                3210089158
                3077377264
                ----------
                 132711894
                 115401647
                 ---------
                  17310247
                  15386886
                  --------
                   1923361
                   1923361
                   -------
                   .......
```

	diviſor.	dividends.	quotients or anſwers.
(2)	.67268479	)56.00000000(	83.2485
	• • • • •		
(3)	9.365407	)87.0763126(	9.297655
	• • • • • • •		

If any whole, mixed, or decimal number is given to be divided by 10, 100, 1000, &c. only remove the ſeparating point towards the left hand ſo many places, as there are cyphers in the diviſor; alſo in multiplication, the ſeparating point is moved to the right hand ſo many places, as there are cyphers in the multiplier.

Multiplication.	Diviſion.
.7865 × 10 = 7.865	10)7865(786.5
.7865 × 100 = 78.65	100)7865(78.65
.7865 × 1000 = 786.5	1000)7865(7.865
.7865 × 10000 = 7865.	10000)7865(.7865
.7865 × 100000 = 78650.	100000)7865(.07865

REDUCTION of DECIMALS.

CASE I.

To reduce a vulgar fraction into a decimal.

RULE.

Annex cyphers to the numerator until it be equal to, or greater than the denominator, then divide by the denominator, and the quotient will be the decimal ſought.

If after you have made uſe of all the cyphers annexed to the numerator, there be a remainder, annex cyphers thereto, and continue your diviſion, until it divide off, or artive, to what degree of exactneſs, you think proper.

Always obſerve to ſet apoint betwixt the numerator, and the cyphers annexed thereto, and that the quotient has as many places, as you annex cyphers to the numerator and remainders, and if it is deficient, let the want be ſupplied by prefixing as many cyphers to the quotient, as it falls ſhort.

(1(Reduce $\frac{1}{2}$ into decimals.

10
2—
.5 Anſr.

(2) Reduce $\frac{1}{4}$ (3) $\frac{3}{4}$ (4) $\frac{1}{8}$ (5) $\frac{1}{16}$ (6) $\frac{30}{32}$ into decimals.

Anſwers .25 .75 .125 .0625 .9375

Reduce $\frac{1}{5}$, $\frac{2}{25}$ and $\frac{3}{125}$ into decimals.

$5)1.0(2=\frac{1}{5}$ $25)2.00(.08=\frac{2}{25}$ $125)3.000(.024=\frac{3}{125}$

Thoſe decimals, that are reduced from ſuch a vulgar fraction, whoſe numerator with cyphers annexed, is an aliquot part of, or can be meaſured by its denominator, are finite, or terminate decimals, as the decimals reſulting from the foregoing examples.

No fraction will produce a finite decimal, but ſuch whoſe denominator is 2 or 5, and their examples.

But ſuch as are produced from a vulgar fraction wohſe numerator with cyphers annexed is not an aliquot part of, or cannot be meaſured by its denominator will be indeterminate, or endleſs.

In circulating decimals if one figure only repeats, it is called a ſingle repetend, as per example, which will be the ſame AD INFINITUM,

Suppoſe tte decimal of $\frac{1}{9}$ $\frac{2}{9}$ $\frac{3}{9}$ $\frac{4}{9}$ $\frac{5}{9}$ $\frac{6}{9}$ $\frac{7}{9}$ &c. was required,

9)1.0000 9)2.0000 9)3.0000

.1111 &c. = $\frac{1}{9}$ .2222 &c. = $\frac{2}{9}$ .3333 &c. = $\frac{3}{9}$

To avoid the trouble of writing down unneceſſary figures, a ſingle repetend is denoted qy the repeating digit daſhed, that is the decimal .11111 &c. = 1 = $\frac{1}{9}$, .22222, &c. = $\underset{\cdot}{2}$ = $\frac{2}{9}$. Alſo .33333, &c. = $\underset{\cdot}{3}$ = $\frac{3}{9}$ = $\frac{1}{3}$: $\underset{\cdot}{4}$ = $\frac{4}{9}$ $\underset{\cdot}{5}$ = $\frac{5}{9}$ $\underset{\cdot}{6}$ = $\frac{6}{9}$ = $\frac{2}{3}$ = $\underset{\cdot}{7}$ = $\frac{7}{9}$ $\underset{\cdot}{8}$ = $\frac{8}{9}$ and $\underset{\cdot}{9}$ $\frac{9}{9}$ = 1

Suppoſe it was required to reduce $\frac{1}{12}$, $\frac{10}{36}$ and $\frac{31}{960}$ into decimals.

12) 1.000 36)5000(.138 = $\frac{5}{36}$ + 32 remr. Anſr.

.083 = $\frac{1}{12}$ Anſr.

960)31.0000000(.0322916 = $\frac{31}{960}$ + 640 remr. Anſr.

The decimals reſulting from theſe laſt examples are called mixec, ſingle repetends, the laſt figure of which will repeat AD INFINITUM.

Let $\frac{2}{11}$ $\frac{3}{7}$ and $\frac{17}{286}$ be reduced into decimals.

11) 2.000000 7),0300000

.181818 &c. $\underset{\cdot}{1}\underset{\cdot}{8}$ Anſr. $\underset{\cdot}{4}2857\underset{\cdot}{1}$ Anſr.

286) 17.0000000 (.0$\underset{\cdot}{5}$9440$\underset{\cdot}{5}$ 170 remr. Anſr.

Note. The repetends are here diſtinguiſhed by a dot under them, inſtead of a daſh or ſtroke drawn though them.

Thoſe decimals in which two, or more figures circulate are called compound repetends, and the manner of diſtinguiſhing them is by daſhing the firſt, and laſt figure of the Repetend, by which means we make one place of the repetend ſufficient, as in the laſt example.

In a compund repetend, any one of the circulating figures may be made the firſt of the repetend; for inſtance, in the repetend 8.6325325325, &c. it may be made 8.63253, or 8.632532; and by this means any two, or more repetends may be made to begin, and end in the ſame place, and then, they are ſaid to be conterminous.

Let $\frac{13}{3731}$ be reduced to a decimal.

3731)13.0000000000(.0034843205 + 2145 remainder.

Anſr.

The decimal reſulting from the laſt example is called an approximate decimal, having ſome places true, and the reſt uncertain; theſe approximating decimals are ſometimes wrote with the ſigns + or — to denote whether the laſt figure is greater or leſs than juſt, thus, 0034843205 + or .0034843206—the firſt ſignifies that the decimal is greater than .0034843805 + by ſome uncertain figure, and the ſegund, viz. .0034843206—denote that the true decimal exceeds .0034843205. and is leſs than .0034843206

Reduce $\frac{5}{26}$ to a decimal.

26)5.0000000(.1923076 + 24 remr. Anſr.

Reduce $\frac{5}{28}$ to a decimal.

28) 5.0000000(.17857142 + 24 remr. Anſr.

Reduce $\frac{11}{14}$ of $\frac{10}{13}$ to a decimal

$11 \times 10 = 110$

$14 \times 13 = 182$

182)110.0000000(6043956 + 8 remr. Anſr.

CASE II.

To reduce a decimal into it's leaſt equivalent vulgar fraction.

First. If the decimal be finite.

RULE.

Under the given decimal write a unit, with as many cyphers, as the decimal conſiſts of places; then divide both the numerator, and the denominator by the greateſt common meaſuring, which gives the leaſt equivalent vulgar fraction required.

Required the leaſt vulgar fraction equivalent to,

	(1)	(2)	(3)	(4)	(5)
	.5,	.25,	.75,	.125, and,	.0625.
Anſrs.	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{3}{4}$	$\frac{1}{8}$	$\frac{1}{16}$

(6) What is the leaſt vulgar fraction equal to .625? Anſr. $\frac{5}{8}$.

$\frac{625}{1000}$ 625)1000(1
625

375)625(1
375

250)375(1
250

c. m. 125)250(2
250

. . .

$\frac{625}{1000} \div 125 = \frac{5}{8}$ Anſr.

(7) Let .5625 be reduced to its loweſt, or leaſt equivalent fraction. Anſr. $\frac{9}{16}$

CASE. III.

To reduce coins, weights, meaſures, &c. into decimals.

RULE. I.

Divide the loweſt of the ſpecies given by as many of that, as make one of the next greateſt: to that quotient annex the next given ſpecies, and divide by as many of that, as make one of the next greateſt, and ſo on; to the laſt quotient annex the integer (if any) and you have the anſwer.

RULE II.

Reduce the different ſpecies into one; viz. the loweſt denomination they confiſt of for a dividend, then reduce the integers into ſame denomination for a diviſor, the reſult will be the decimal required.

RULE III.

Take parts with the denominations given tc be reduced, out of the integer of the ſame denomination

(1) Reduce 7 a. 6 p. to the decimal of a rupee.

Firſt way. 12)6.0

7·5

16—

.46875 Anſr.

Second way. 1=16 7a. 6p.

12 12

192p. 192)90.0(.46875 Anſr.

768

1320

1152

1680

1536

1440

1344

960

960

. . .

1

Third way. 4 a. — ¼ — 25
2 — ½ — 125
1 — ½ — 625
6 p. — ½ — 2125

.46875 Anſr.

(2) Reduce 10s. 9¼ d. to the decimal of a pound. Anſr. .5385416+

(3) Reduce 24 ſeers to the decimal of a maund. Anſr. .6 maunds.

(4) Reduce 14 chahtacks to the decimal of a maund. Anſr. .21875 maunds.

(5) Reduce 4 cwt. 2 qrs. to the decimal of a ton. Anſr. .225 ton.

(6) Reduce 14 ſrs. 8 chs. to the decimal of a maund. Anſr. .3625 maund.

(7) Reduce 174 drams to the decimal of an cwt. Anſr. .0060686+ cwt.

(8) Reduce 4 inches to the decimal of a cubit. Anſr. .22222222+ cubit.

(9) Reduce 76 yards to the decimal of a mile. Anſr. .0431818+ mile.

(10) Reduce 1 mile to the decimal of a league. Anſr. .33333333+ league.

(11) Reduce 3 qrs. 2ns. to the decimal of a yard. Anſr. .875 yd.

(12) Reduce 4 cottahs to the decimal of a biggah Anſr. .1 biggah.

(13) Reduce 1 pint to the decimal of a gallon. Anſr. .125 gallon.

(14) Reduce 1 gallon of wine to the decimal of a hogſhead. Anſr. .015873+ hogſhead.

(15) Reduce 7 minutes to the decimal of a day. Anſr. .0048611+ day.

(16) Reduce 2 days to the decimal of a week. Anſr. .2957142 +week.

(17) Reduce 72 days to the decimal of a year. Anſr. .1972602+ year.

CASE IV.

To reduce any decimal into the equivalent known parts of coin, weight, meaſure.

RULE.

Multiply the given number by the number of units, contained in the next inferior denomination, cutting off as many figures from the product, as the given decimal conſiſts of, then multiply the remaining parts (if any) by the next lower denomination, cutting off as before, and thus proceed till you have converted your decimals, or come to the loweſt part, and the ſeveral figures to the left-hand of the ſeparating points, will be the ſerveral parts of the quantity required.

(1) What is the proper quantity of .76 of a rupee?

.76
16

A. 12.16
12

Anſr. 12 a. 1.92 p.

P. 1.92

(2) What is the proper quantity of .861 of a maund ? Anſr. 34ſrs. 7.04 chs.

(3) What is the proper quantity of .461 of a ſhilling ? Anſr. 5d. 2.128qrs.

(4) What is the proper quantity of .761 of a hogſhead of wine ? Anſr. 47 galls. 3 qts. 1.544 pt.

(5) What is the proper quantity of .17 of a ton of wine ? Anſr. 42 galls. 3.36 qts.

(6) What is the proper quantity of .761 of a day ? Anſr. 18 hrs. 15 ms, 50.4 ſecs.

(7) What is the proper quantity of .7 of a pound troy of ſilver ? Anſr. 8 oz. 8 dwts.

(8) What is the proper quantity of .71 of 4 chahtacks of gold ? Anſr. 2 ſrs. 13.44 lbs.

(9) What is the proper quantity of .67 of a league ? Anſr. 2 m. 0 f. 3 p. 1 yd. 0 ft. 3 i. 1.8 b. c.

(10) What is the proper quantity of .712 of a furlong ? Anſr. 28 ps. 2 yds. 1 ft. 11.04 in.

(11) What is the proper quantity of .07 of a barrel of ale ? Anſr. 2 gals. 0 qts. 1.92 pt.

(12) What is the proper quantity of .4712 of an ell Engliſh ? Anſr. 2 qrs. 1.424 nl.

(13) What is the proper quantity of .72 of a hogſhead of beer ? Anſr. 38 gals. 3 qts. 1.04 n.

(14) What is the proper quantity of .61 of a tun of wine ? Anſr. 2 hhds. 27 gals. 2 qts. 1.76 pt.

(15) What is the proper quantity of .092 of 13 big. 2 cot. ? Anſr. 48.024 biggahs.

(16) What is the proper quantity of .461 of 29 ſeers of opium ? Anſr. 13 ſrs. 5.904 chs.

(17) What is the proper quantity of .712 of 13 annas? Anſr. 9 a. 3.072 p.

(18) What is the proper quantity of .12 of a cubit? Anſr. 2.16 inches.

(19) What is the proper quantity of .3 of a year? Anſr. 109 ds. 13.8 hrs.

(20) What is the proper quantity of .5 of an hour? Anſr. 30 minutes.

(21) A certain tenant hired an houſe for 9 months at 112.4 per month, how much was due at the end of the term? Anſr. 1011 rs. 9 a. 6.72 p.

Addition and Subtraction of Decimals.

RULE I.

REDUCE each denomination to the decimal of the integer, or the decimal of any one denomination, then add or ſubtract as required, and reduce the ſum or remainder to their proper quantity.

RULE II.

Reduce the decimals to their proper quantity, then add or ſubtract as in whole numbers.

(1) What is the ſum of .148 of a rupee and .196 of an anna reduced to their proper quantity?

Firſt way. .196
16
.01225
.148
.16025
16
a. 2.56400
12
p. 6.768

Anſr. 2 a. 6.768 p.

Firſt way. .148
16
a. 2.368
.196
.564
12
p. 6.768

Anſr. 2 a. 6.768 p.

Second way. .148
16
a. 2.368
12
p. 4.416

a.
196
12
p. 2.352

a. 2 4.416 p.
2.352
a. 2 6.768 p. Anſr.

(2) What is the ſum of .17 md. and .84 ſr.? Anſr. 7 ſrs. 10.24 chs.

(3) What is the ſum of .17 ton .19 cwt. .17 qrs. and 7lb.? Anſr. 3 cwt. 2 qrs. 15.54 lb.

(4) What is the difference between .117 and .57 of a rupee? Anſr. 7 a. 2.976 p.

(5) What is the difference between .41 of a day and .16 of an hour? Anſr. 9 hrs. 40 min. 48 ſec.

(6) What is the ſum of .728 of a maund and .94 of a ſeer, reduced to their proper quantities? Anſr. 30 ſrs. 0.96 ch.

(7) What is the ſum of .74 of a yard and .84 of a cubit, reduced to their proper quantities? Anſr. 2 qrs. 5.76 nls.

(8) What is the difference between .18 of a rupee, and .9 of an anna, reduced to their former quantities? Anſr. 1 a. 11.76 p.

(9) What is the difference between .98 of a maund and .24 of a ſeer reduced to their proper quantities? Anſr: 38 ſrs. 15.36 chs.

(10) What is the difference between .174 of a yard and .86 of a cubit, reduced to their proper quantities? Anſr. 9.216 inches.

The Single Rule of Three,

IN DECIMALS.

OBSERVE the ſame rule for ſtating and working the terms as before directed. Let the firſt and third terms be reduced either to the decimal parts of the integer or the decimals of one denomination as will appear moſt convenient, and let the ſecond term be reduced to the ſame denomination as required in the anſwer, then will the fourth term be the anſwer ſought.

(1) If 1.4 ſeer of ſago coſt 14.5 annas, what coſt 1 md. 35.31 ſrs.?

1.4 ſr. : 14.5 a. : : 35.31 ſr. : 48rs. 11a. 11.957p.

40—— 16—— 40———

.035 md. .90625 r. 88275 md.

(2) If 1.47 maund of ſugar be worth 7.5 rupees, what is 1.7 ſeer worth at that rate? Anſwer. 3a. 5.6256 p.

(3) If 8.4 ſeers of upium coſt 1 r. 6 a. 4.8 p. what coſt .3 bales each 4 mds. 2 ſrs. 7.4 chs.? Anſr. 92 rs. 5 a.

(4) If 1.6 cwt. of ſugar coſt 3l. 12.76s. what coſt 3 hogſheads each, 11 cwt. 3 qrs. 10.12 lbs? Anſr. 80l. 15ſ. 3d. 3.36 qrs.

(5) If 1.5 ounces of ſilver be worth 7.5 rupees, what is 9.7 pounds worth at that rate? Anſr. 582 rupees.

(6) If 1 bottle of wine coſt 1.2 rupees, what coſt 12.5 hogſheads ſuppoſing each bottle to hold a quart exactly? Anſr. 3780 rupees.

(7) If 1 yard of cloth coſt 12.3 rupees, what coſt 3 bales each 21.5 yards? Anſr. 793 r. 5 a. 7.2 p.

(8) A man bought a piece of cloth for 30 r. 8 a. 6 p. I demand how many cubits there were in the ſame, when he gave after the rate of 11 a. 2.6 p. per cubit? Anſr. 43 cub.9.9684 in.

(9) A man bought 5.8 maunds of oil for 60.4 rupees; but by misfortune he chanced to loſe 50.9 ſrs. I demand, how he muſt ſell the reſt per ſeer, to be no loſer? Anſr. 5 a. 4.035264 p.

(10) Two men bartered, A. had 40.7 yards of linen, for which B. gave him 25.6 cubits of muſlin at 4.5 rupees per cubit. I demand the price of the linen per yard? Anſr. 2 r. 13 a. 3.4496256 p.

(11) A man bought 7.6 maunds of ſugar, at 16.1 per maund, and ſold the ſame at 6.5 per ſeer. I demand, whether he gained or loſt, and how much? Anſr. 1 r. 2 a. 2.88 p.

(12) A ſhrub-vender, made a quantity of mango-ſhrub, which coſt him in making 900.4 rupees, af-

terwards ſold it in caſks at 26.7 rupees, by which he gained 300 rupees. I demand the quantity, that was brewed, when each caſk contained 20 gallons? Anſr. 899.176 gallons.

(13) A perſon bought 3 mds, 1.5 ſrs. of cloves at the rate of 2.75 rupees per ſeer, and ſold them for 300 rupees: what did he gain or loſe by the bargain? Anſr. 34 r. 2 a. loſt.

(14) A merchant bought 436 cubits of cloth, for 8.5 annas per cubit, and ſold it again for 10.75 annas per cubit: what did he gain by the ſale thereof? Anſr. 61 r. 5 a.

(15) A. owes B. 2960.85 rupees; but he compounds for 7.5 annas in the rupee: what muſt B. receive of his debt? Anſr. 1387 r. 14 a. 4.5 p.

(16) Bought 3 caſes of opium, each weighing 4 mds. 21.9 ſrs. at 6 rupees per maund, which he ſold out at 7.165 rupees per maund: what did he gain by the whole? Anſr. 213 r. 8.02 a. gain, and 27.94643 per cent.

DUODECIMALS,

ARE fractions of a foot, an inch, or any part of an inch, having 12 for their denominator.

Notation

Notation of Duodecimals.

Duodecimals are written thus:

Ft.	In.	″	‴	⁗
3	7	2	3	7

and are read as 3 feet, 7 inches, 2 ſeconds, 3 thirds, 7 fourths, &c.

Addition of Duodecimals.

12 fourths make 1 third.
12 thirds - - 1 ſecond.
12 ſeconds - - 1 inch.
12 inches - - 1 foot.

(1)

Ft.	In.	″	‴	⁗
14	4	3	5	6
17	10	11	10	4
16	3	7	5	8
19	1	10	11	11
19	3	5	7	11
46	4	9	10	6
133	5	1	3	10

(2)

Ft.	In.	″	‴	⁗
28	4	3	7	10
36	10	3	11	5
19	10	4	7	6
39	5	6	9	4
47	6	2	10	11
92	11	10	3	7
265	0	8	2	7

(3) A joiner having finiſhed ſeveral very curious pieces of workmanſhip, would know the contents of the whole: now the firſt piece meaſured 17 feet, 10 inches, 2 ſeconds, and 1 third. The ſecond meaſured 20 feet, 4 inches, and 7 thirds. The third 49 feet, 6 inches, and 9 ſeconds. The

fourth fourſcore feet, and 10 ſeconds. The fifth 17 feet, and 4 thirds. The ſixth, threeſcore feet, and 10 ſeconds, and the ſeventh 37 feet, and 9 thirds: what was the content in ſquare meaſure? Anſr. 281 ft. 10 in. 8 ſec. 9 thirds.

Subſtraction of Duodecimals.

(1)	Ft.	Ins.	''	'''	''''
From	74	3	4	7	6
Take	19	4	8	8	10
	54	10	7	10	8

(2) Ft.	In.	''	'''	''''
1000	5	7	3	1
907	8	9	10	11
92	8	9	4	2

(3) A joiner having lined ſeveral rooms very curiouſly with cedar, finds the amount to be in ſquare meaſure 800 feet, 3 inches, 4''; but ſeveral deductions being to be made for windows, arches, &c. thoſe deductions amounted to 70 ft. 3 in. 7'' 10''' 5'''' how many feet of workmanſhip muſt he be paid for? Anſr. 729 ft. 11 in. 8 ſec. 1''' 7''''.

Croſs Multiplication.

RULE.

FEET multiplied by feet give feet.

Feet multiplied by inches give inches.

Feet multiplied by ſeconds give ſeconds.

Inches multiplied by inches give ſeconds.

Inches multiplied by ſeconds give thirds.

Seconds multiplied by ſeconds give fourths, &c.

The truth of any of theſe operations may be proved by reducing their factors into inches, and dividing their product by 144, the number of ſquare inches in a foot ſquare, the quotient will be the anſwer. They may alſo be wrought by Vulgar Fractions and Decimals. And when the number of feet happens to be large in either or both of the factors, inſtead of multiplying by inches, if there are any, you may take parts with them.

(1) Multiply 7 ft. 3 in. by 4 ft. 7 in.

Firſt way. 7 3
4 7

29
4 2 9

Feet 33 2 9 Anſr.

Second way. 7 ſt. 3 in. = 87 in.
4 7 = 55

435
435

144)4785(33 ſt.
432

465
432

32
12

144)396(2 in.
288
————
108
12
————
144)1296(9''
1296
————
....

Anſr. 33 ft. 2 in. 9,''

Third way. 7 ft. 3 in. = $7\frac{3}{12}$ 4 ft. 7 in. = $4\frac{7}{12}$

$\frac{87}{12}$ $\frac{55}{12}$

87 × 55 = 4785

12 × 12 = 144

144)4785(33 ft. 2 in. 9''

Fourth way. 4 ft. 7 in. = 4.5833
7 3 = 7.25

4.5833 × 7.25 = 33.228925 ft. Anſr.

	ft.	in.	''		ft.	in.	''		ft.	in.	''	'''	''''
(2)	7	5	—	×	3	9	—	=	27	9	9	—	—
(3)	4	6	—	×	5	8	—	=	25	6	—	—	—
(4)	9	7	—	×	9	7	—	=	91	10	1	—	—
(5)	7	10	—	×	8	11	—	=	69	10	2	—	—
(6)	3	11	—	×	9	5	—	=	36	10	7	—	—
(7)	7	3	2	×	1	7	3	=	11	7	9	11	6
(8)	8	6	9	×	7	3	8	=	62	6	7	9	—
(9)	3	10	6	×	7	4	8	=	28	7	7	—	—

	ft.	in.	″		ft.	in.	″		f..	in.	″	‴	⁗
(10)	5	6	7	×	8	9	10	=	48	11	2	8	10
(11)	76	7	—	×	48	9	—	=	3733	5	3	—	—
(12)	767	5	—	×	198	3	—	=	152440	4	3	—	—
(13)	49	3	1	×	48	1	2	=	2369	1	5	7	2
(14)	76	3	9	×	84	7	11	=	6460	7	1	8	3
(15)	487	11	10	×	186	10	11	=	91209	4	2	2	2

Diviſion of Duodecimals.

RULE.

FOR any diviſor leſs than 12, or their multiples perform the operation as in Compound Diviſion; but when both factors conſiſt of ſeveral denominations, the plaineſt way, though not the ſhorteſt, is to reduce them to their loweſt parts, and divide as in whole numbers.

(1) ft. in. ″ ‴ ⁗
8)712 8 4 3 7(3
89 1 0 6 5

(2) ft. in. ″ ‴ ⁗
9)972 0 4 2 7(4
108 0 0 5 7

	ft.	in.	″		ft.	in.	″	‴			ft.	in.	″	‴
(3)	30	0	—	)	810	9	7	—	—	(	27	0	3	10
(4)	48	9	—	)	3733	5	3	—	—	(	76	7	—	—
(5)	1	7	3	)	11	7	9	11	6	(	7	3	2	—
(6)	12	3	10	)	119	8	2	10	10	(	9	8	7	—

Involution

Involution and Evolution.

INVOLUTION is the raiſing of any given number to any propoſed powers.

Evolution is the unravelling, or unfolding any propoſed number into the parts, of which it was made up or, compoſed.

If any number is multiplied into itſelf, that product is called a ſquare number.

Thus the ſquare numbers, 4, 9, 16, 25, 36, &c. are each of them compoſed of two equal numbers, viz. 2 × 2 = 4, 3 × 3 = 9, 4 × 4 = 16.

If any number is multiplied into itſelf, and that product is multiplied into the ſame number, the ſecond product is called a cube number.

Thus the cube numbers 8, 27, 64, &c. are each compoſed of 2 × 2 × 2 = 8; 3 × 3 × 3 = 27, 4 × 4 × 4 = 64. &c.

Theſe powers exiſt in nature, viz. a root is repreſented by a line or ſide having but one dimenſion, viz. only length: the ſquare is a plain figure of two dimenſions, viz. length and breadth; and the cube of three, viz. length, breadth, and thickneſs.

All the ſuperior powers have no exiſtence in nature; but are compoſed of a multiplication of any number four or more times into itſelf.

Thus, 2 × 2 × 2 × 2 = 16 the biquadrate, whoſe root is 2.

Or 3 × 3 × 3 × 3 × 3 = 243 the ſurſolid, whoſe root is 3, have no exiſtence in nature, but may be underſtood, as a ſeries of numbers in geometrical progreſſion.

When any number is propoſed to have the root extracted, the firſt work is to prepare it by points ſet over (or under) their proper figures, according as the given power; whoſe root is ſought doth require, which for the ſquare is 2, for the cube is 3, for the biquadrate 4, &c. always beginning thoſe points over the place of unity towards the left hand, if the given numbers are integers, and deſcend towards the right hand in decimal parts.

Thus. For the ſquare root, $\dot{5}8\dot{3}7\dot{4}2\dot{9}6\dot{4}3\dot{8}4\dot{7}$

Cube $\dot{5}83\dot{7}42\dot{9}64\dot{3}84\dot{7}$

Biquadrate $\dot{5}837\dot{4}296\dot{4}384\dot{7}$

Surfolid $58\dot{3}7429\dot{6}4384\dot{7}$

Or in Decimals,

Thus. For the ſquare root $.\dot{0}5\dot{3}2\dot{7}9\dot{4}3\dot{8}4\dot{7}2\dot{8}$

Cube $.\dot{0}53\dot{2}79\dot{4}38\dot{4}72\dot{8}$

Biquadrate $.\dot{0}532\dot{7}943\dot{8}472\dot{8}$

Surfolid $.\dot{0}5327\dot{9}4384\dot{7}28$

Note. ©' ſignifies involution, thus 27 ©' or 27^3, ſignifies that 27 is to be involved into the third power.

$\surd$ or $\surd q$ denotes evolution, thus, $\surd 4=2$ ſignifies that the ſquare root of 4 equals 2, or $\surd\,^{3}27=3$ the cube, or root, of the third power of $27=3$.

(1) What is the ſquare of 17.1?

```
   17.1
   17.1
  -----
    171
  1197
 1.71
 ------
 292.41 Anſr.
```

(2) What is the ſquare of .09? Anſr. .0081

(3) What is the ſquare of .0094? Anſr. .00008836.

(4) Produce the ſquare of 500. Anſr. 250000.

To extract the Square Root of any Square.

IF the ſquare conſiſts of no more than two figures, the root is known from the table.

But if it conſiſts of more than two places, the root is extracted by the following

RULE.

Diſtinguiſh the ſquare into periods, by putting a point over the firſt figure, and ſo over every other figure upwards.

Draw a lunule (or crooked line) to the right hand of the ſquare, as for the quotient in diviſion.

From the table take the ſquare equal to, or next leſs than the laſt period, (that next the left hand) and put it under the ſaid period, and its root after the lunule, as a quotient figure.

Subſtract the aſſumed ſquare from the laſt period, and to the remainder bring down the next period, and this is called the reſolvend.

Double the root or quotient found before, and drawing a lunule to the left of the reſolvend, put the double of the root to the left of the lunule, as a diviſor in diviſion; but leaving room for another figure to the right hand.

Seek how often this diviſor is contained in all the figures of the reſolvend except the firſt (which muſt not be more than 9 times) and put the figure expreſſing how often for the next lower number in the quotient or root.

Still place the laſt found quotient figure for the units of the diviſor, and then multiply the ſaid whole diviſor by the quotient figure (as in diviſion) and placing the product under the reſolvend ſubſtract it therefrom.

To the remainder bring down the next period for a new reſolvend, and ſo proceed from period to period, till they are all brought down one by one, and if the ſquare is perfect, nothing will remain at laſt.

(1) What is the ſquare root of 4712.81261 ?

· · · · ·
4712.81261(68.649 + Anſr.
36

128)1112 reſolvend.
1024

1366)8881
8196

13724).68526
54896

137289)1363010

```
137289)1363010
       1235601
       -------
        127409 remainder.
```

(2) What is the ſquare root of 9712.718051? Anſr. 98.553 +

(3) What is the ſquare root of 3.1721812? Anſr. 1.78106 +

(4) What is the ſquare root of 1.3976121? Anſr. 1.1822 +

(5) What is the ſquare root of 761.801216? Anſr. 27.6007 +

(6) What is the ſquare root of .0007612816? Anſr. .02759 +

(7) What is the ſquare root of 4.000067121? Anſr. 2.000016 +

(8) Extract the ſquare root of 1850701.764025 Anſr. 1360.405.

Of the Square Root of a Vulgar Fraction.

TO extract the ſquare root of a Vulgar Fraction.

R U L E.

Firſt. Reduce the fraction to its loweſt term.

Secondly. Extract the ſquare root of the numerator for a new numerator, and the ſquare root of the denominator for a new denominator.

Thirdly. If the fraction is a ſurd, reduce it to a decimal, and then extract the ſquare root from it.

Fourthly. The decimal fraction muſt conſiſt of an even number of places, as two, four, &c.

(1) What is the ſquare root of $\frac{3044}{6849}$?

```
761)6849(9 dr.   3044)6849(2   761)3044(4 nr.
    6849              6088          3044
    ————              ————          ————
    ....:      c. mr. 761(3044(4 n.
   ======                 3044
                          ————
     4(2  9(3             ....
     4    9              ======
     —    —
     .    .
     =    =
```

$\frac{4}{9}\surd = \frac{2}{3}$ Anſr.

(2) What is the ſquare root of $\frac{3456}{5400}$? Anſr. $\frac{16}{25}\surd = \frac{4}{5}$.

(3) What is the ſquare root of $\frac{7056}{9216}$? Anſr. $\frac{49}{64}\surd = \frac{7}{8}$.

SURDS.

(1) What is the ſquare root of $\frac{3168}{6192}$? Anſr. .71528+

(2) What is the ſquare root of $\frac{208}{72}$? Anſr. .87447+

(3) What is the ſquare root of $\frac{387}{738}$? Anſr. .72414+

Of the Square Root of a Mixed Number.

TO extract the ſquare root of a mixed number.

RULE.

Firſt. Reduce the fractional part of the mixed number to its loweſt terms.

Secondly. Reduce the mixed number to an improper fraction.

Thirdly. Extract the roots of the numerator and denominator, for a new numerator and denominator.

Fourthly. If the mixed number given is a ſurd, reduce the fractional part to a decimal, and annex it to the whole number, and extract the ſquare root from the whole.

(1) What is the ſquare root of $37\frac{36}{49}$?

```
  37        1849(43      49(7
  49        16           49
 ----       ----         --
  333   83) .249                  43
 148         249                  --
 ----       ----          43       7
 1813        ...        7--
   36                     6 1/7 Anſr.
 ----
 1849
 ----improper fraction.
  49
```

(2) What is the ſquare root of $17\frac{16}{25}$? Anſr. $4\frac{1}{5}$

(3) What is the ſquare root of $5\frac{288}{648}$? Anſr. $2\frac{1}{3}$

SURDS.

(1) What is the ſquare root of $76\frac{14}{17}$? Anſr. 8.7649+

(2) What is the ſquare root of $7\frac{9}{11}$? Anſr. 2.7961+

OF

OF THE CUBE ROOT.

RULE.

ANY number multiplied by its ſquare produces a cube, and to extract the cube root, Firſt, Prepare the given number for extraction by pointing off from the unity place, as the root required directs.

Secondly. Find the firſt figure of the root by your own judgment, or by inſpection into the table of powers.

Thirdly. Subſtract it from the given number.

Fourthly. Augment the remainder by the next figure in the given number, that is by the firſt figure in the next point, and call this your dividend.

Fifthly. Involve the whole root laſt found into the next inferior power, to that which is given.

Sixthly. Multiply it by the index of the given power, and call this your diviſor.

Seventhly. Find a quotient figure by common diviſion, and annex it to the root.

Eighthly. Involve all the root thus found into the given power.

Ninthly. Subſtract this power always from as many points of the given number, as you have brought down, beginning at the loweſt place.

Tenthly. To the remainder bring down the firſt figure of the next point for a new dividend.

Eleventhly. Find a new diviſor as before, and in like manner proceed until the work is ended.

(1) What is the cube of 6.4?

$$\begin{array}{r} 6.4 \\ \hline 256 \\ 384 \\ \hline 40.96 \\ 6.4 \\ \hline 16384 \\ 24576 \\ \hline \text{Cube.} = 262.144 \\ \hline\hline \end{array}$$

Anſr.

(2) What is the cube of .13? Anſr. .002197.
(3) What is the cube of 4.11? Anſr. 69.426531.
(4) What is the cube of .09? Anſr. .000729.
(5) What is the cube of .007? Anſr. .000000343.
(6) What is the cube root of 7612.812161?

· · · ·
7612.812161(19.67 + Anſr.
1×1×1=1 ſubtrahend

1×1×3=3)66 dividend

19×19×19=6859 ſub.

19×19×3=1089)·7538 div.

196×196×196=7529536 ſub.

196×196×3=115248)··832761 div.

1967×1967×1967=7610498063 ſub.

···2314098 remainder.

(7) What is the cube root of 7612181.7612? Anſr. 196.71+.

(8) What is the cube root of 61218.00121? Anſr. 39.41+.

(9) What is the cube root of 7121.1021698? Anſr. 19.238+.

(10) What is the cube root of 12000.812161? Anſr. 22.89+.

(11) What is the cube root of 121861281? Anſr. 495+.

(12) What is the cube root of .0069761218? Anſr. .19107+.

Of the Cube Root of a Vulgar Fraction.

TO extract the cube root of a vulgar fraction.

Firſt. Reduce the fraction to its loweſt terms.

Secondly. Extract the cube roots of the numerator and denominator for a new numerator and denominator.

Thirdly. If the fraction is a ſurd, reduce it to a decimal, and then extract the cube root from it.

Fourthly. The decimal fraction muſt conſiſt of ternaries of places, as three, ſix, nine, &c.

(1) What is the cube root of $\frac{352}{1188}$

8(2 nr.
2×2×2 = 8

352)1188(3
1056

.132)353(2
264

.88)132(1
88

c. m. .44)88(2
88

27(3 dr.
3×3×3= 27

$\frac{352}{1188} \div 44 = \frac{8}{27}$ loweſt term.

Anſwer $\frac{2}{3}$

(2) What is the cube root of $\frac{1944}{4608}$? Anſwer $\frac{3}{4}$.
(3) What is the cube root of $\frac{648}{3000}$? Anſwer $\frac{3}{5}$.

SURDS.

(1) What is the cube root of $\frac{4}{9}$? Anſwer .763.
(2) What is the cube root of $\frac{6}{7}$? Anſwer .949+.
(3) What is the cube root of $\frac{1}{3}$? Anſwer .693+.

Of the Cube Root of a Mixed Number.

TO extract the cube root of a mixed Number.

Firſt. Reduce the fractional part to its loweſt terms.

Secondly, Reduce the mixed number, to an improper fraction.

Thirdly. Extract the cube roots of the numerator and denominator, for a new numerator, and denominator.

Fourthly. If the mixed number given is a ſurd, reduce the fractional part to a decimal, and annex it to the whole number, and extract the cube root from the whole.

(1) What is the cube root of $578\frac{19}{27}$?

$$
\begin{array}{r}
578 \\
27 \\
\hline
4046 \\
1156 \\
\hline
15606 \\
19 \\
\hline
15625 \\
\hline
27
\end{array}
$$

15623′25 nr.

2×2×2=8 ſubtrahend.

2×2×3=12) 76 dividend.

25×25×25=15625 ſub.

. . . . .

27(3 dr. $\frac{25}{3}$

3×3×3=27

. .

$$3\overline{)\,25\,}$$

$8\frac{1}{3}$ Anſr.

(2) What is the cube root of $42\frac{21}{24}$? Anſr. $3\frac{1}{2}$.

(3) What is the cube root of $5\frac{104}{125}$? Anſr. $1\frac{4}{5}$.

SURDS.

What is the cube root of $8\frac{2}{12}$?

$12)2.00000000$

$8.16666666\frac{8}{12}(2.013+$

$2\times2\times2=8$ ſubtrahend.

$2\times2\times3=12).1$ dividend.

$20\times20\times20=8000$ ſub.

$20\times20\times3=1200)..\ 1666$ div.

$201\times201\times201=8120601$ ſub.

$201\times201\times3=121203)..\ 46065$ div.

$2013\times2013\times2013=8157016197$ ſub.

$...9650469$ remr.

Anſr. 2.013+

(5) What is the cube root of $7\frac{3}{5}$? Anſr. 1.966.+

Of the Biquadrate Root.

ANY number involved four times produces a biquadrate. To extract the biquadrate root, firſt extract the ſquare root of the given reſolvend, and then extract the ſquare root of that ſquare root for the biquadrate root required.

(1) What is the biquadrate of 48? Anſr. 5308416.

(2) What is the biquadrate of 96? Anſr. 84934656.

(3) What is the biquadrate root of 5308416? Anſr. 48.

(4) What is the biquadrate root of 84934656? Anſr. 96.

(5) What is the biquadrate root of 21743271936? Anſr. 384.

Of the Surſolid Root.

ANY number involved five times produces a ſurſolid.

To extract the root of a ſurſolid uſe the ſame rule as in extracting the cube root.

(1) What is the ſurſolid of 48? Anſr. 254803968.

(2) What is the ſurſolid root of 8153726976? Anſr. 9.

(3) What is the ſurſolid root of 254803968? Anſr. 48.

(4) What is the ſurſolid root of 839416423424? Anſr. 384.

Of the Square Cube Root.

ANY number involved ſix times produces a ſquare cube and to extract the ſquare cube root, firſt depreſs the given reſolvend to a cube, by extracting the ſquare root, and the cube root of that reſolvend when extracted will produce the ſquare cube root required.

(1) What is the ſquare cube of 48? Anſwer 12230590464.

(2) What is the ſquare cube root of 782757789696? Anſr. 96.

(3) What is the ſquare cube root of 12230590464? Anſr. 48.

(4) What is the ſquare cube root of 3206175906594816? Anſr. 384.

Of the Second Surſolid Root.

ANY number involved ſeven times produces a ſecond ſurſolid, and to extract the root of a ſecond ſurſolid uſe the ſame rule as in extracting the cube root.

(1) What is the ſecond ſurſolid of 95? Anſr. 75144747810815.

(2) What is the ſecond ſurſolid root of 75144747810316? Anſr. 96.

(3) What is the ſecond ſurſolid root of 587068342272 Anſr. 48.

(4) What is the ſecond ſurſolid root of 1231171548132409344? Anſr. 384.

Of the Square Biquadrate Root.

ANY number involved eight times is a biquadrate ſquare, or ſquare biquadrate, and to extract the ſquare biquadrate root, extract the ſquare root of the given reſolvend, which will reduce it to a biquadrate number, which call a new reſolvend, the ſquare root of which will be a ſquare number, of which extract the ſquare root, which root will be the reſult required.

(1) What is the ſquared biquadrate of 48? Anſr. 28179280429056.

(2) What is the ſquared biquadrate root of 7213895789 838336? Anſr. 96.

(3) What is the ſquare biquadrate root of 28179280 429056? Anſr. 48.

(4) What is the ſquare biquadrate root of 47276987 4482845188096? Anſr. 384.

Of the Cubed Cube Root.

ANY number involved nine times is a cubed cube, and to extract its root, extract the cube root of the given reſolvend, and the reſult will be a cubick reſolvend, of which extract the cube root alſo, which will be the root of the ninth power required.

(1) What is the cubed cube root of 692533995824 480256? Anſr. 96.

(2) What is the cubed cube root of 1352605460594 688? Anſr. 48.

(3) What is the cubed cube root of 18154363180141 2552228864? Anſr. 384.

Of the Square Surſolid Root.

ANY number involved ten times produces a ſquared ſurſolid, and to extract its root, firſt ſquare the given reſolvend, which depreſſes it to a ſurſolid, whoſe root being extracted produces the ſquare ſurſolid root.

(1) What is the ſquared ſurſolid root of 64925062 108545024? Anſr. 48.

(2) What is the ſquared ſurſolid root of 66483263599150104576? Anſr. 96.

(3) What is the ſquared ſurſolid root of 69712754611742420055883776. Anſr. 384.

Of the Third Surſolid Root.

ANY number involved eleven times produces a third ſurſolid, and to extract its root uſe the ſame rule as in extracting the cube root.

(1) What is the third ſurſolid root of 952809757913927? Anſr. 23.

(2) What is the third ſurſolid root of 311640298121016 1152? Anſr. 48.

(3) What is the third ſurſolid root of 6382393305518410039296? Anſr. 96.

Of the Squared Square Cube Root.

ANY number involved twelve times produces a ſquared ſquare cube, and to extract its root firſt ſquare the given reſolvend which depreſſes it to a ſquare cube, then proceed as in extracting the ſquare cube root.

(1) Extract the root of this ſquared ſquare cube of 149587343098087735296? Anſr. 48.

(2) What is the root of this ſquared ſquare cube of 612709757329767363772416? Anſr. 96.

(3) What is the root of this ſquared ſquare cube of 10279563944029090291760398073856? Anſr. 384.

SOME

SOME USES
OF
Involution and Evolution.
EXEMPLIFIED.

THERE is an army conſiſting of a certain number of men, who are placed rank and file, in the form of a ſquare, each ſide having 472 men, I demand how many men the whole ſquare contained?

472×472=222784 men. Anſr.

(2) The floor of a certain great room is made exactly ſquare, each ſide of which contains 75 feet, I demand how many ſquare feet are contained therein?

75×75=5625 ſquare feet. Anſr.

(3) Suppoſe 12544 ſoldiers are to be placed rank and file in the form of an equal ſquare. I demand how many ſoldiers will be in the front, and how many deep?

$\sqrt{12544}=112$ ſoldiers. Anſr.

(4) A certain ſquare pavement contains 197136 ſquare ſtones, all of the ſame ſize. I demand how many are contained in one of its ſides?

$\sqrt{197136}=444$ Anſr.

(5) The wall of a town is 17 feet high, which is ſurrounded by a mote of 20 feet in breadth, I demand the length of a ladder, which ſhall reach from the outſide of the mote to the top of the wall?

17×17=289
20×20=400
289+400=689
$\sqrt{689}=26.2+$ft. Anſr.

(6) Two ſhips ſet ſail from the ſame port, one of them goes due eaſt 50 leagues, the other due north 84 leagues, how far are they aſunder?

$$50 \times 50 = 2500$$
$$84 \times 84 = 7056$$
$$7056 + 2500 = 9556$$
$$\sqrt{9556} = 97.75+$$ leagues Anſr.

(7) If a cubical piece of Timber be 41 inches long, 41 inches broad, and 41 inches deep, how many cubical inches does it contain?

$$41 \times 41 \times 41 = 68921$$ inches Anſr.

(8) Suppoſe a tank to be dug up, that ſhall be 12 cubits every way, in length, breadth, and depth, how many ſolid cubits of earth muſt be taken out to compleat the ſame?

$$12 \times 12 \times 12 = 1728$$ cubits. Anſwer.

(9) Suppoſe a ſtone of a cube form to contain 474552 inches ſolid, what is the ſuperficial contents of one of its ſides?

$$474552 \times 474552 = 225199600704$$
$$\sqrt[3]{225199600704} = 6084$$ inches. Anſwer.

(10) Suppoſe the length of a ſhip's keel be 125 feet, the breadth of the midſhip beam 25 feet, and the depth of the hold 15 feet, I demand the dimenſions of another ſhip of the ſame form, that ſhall carry three times the burthen?

$$125 \times 125 \times 125 = 1953125.$$
$$1953125 \times 3 = 5859375.$$
$$\sqrt[3]{5859375} = 180.28 +$$ feet keel. Anſwer.
$$25 \times 25 \times 25 \times 3 = 46875.$$

$\sqrt[3]{46875} = 36.05 +$ feet midſhip beam. Anſwer.

$15 \times 15 \times 15 \times 3 = 10125.$

$\sqrt[3]{10125} = 21.6 +$ feet depth. Anſwer.

(11) Required the dimenſions of a ſhip, which is but half the burthen of that, whoſe dimenſions are given as above?

$$\frac{125\times125\times125}{2} = 976562.5$$

$\sqrt[3]{976562.5} = 99.212+$ ft. keel. Anſr.

$$\frac{25\times25\times25}{2} = 7812.5$$

$\sqrt[3]{7812.5} = 19.84+$ft. midſhip beam Anſr.

$$\frac{15\times15\times15}{2} = 1687.5$$

$\sqrt[3]{1687.5} = 11.905+$ft. depth Anſr.

(12) Required the tonnage of the three veſſels as above?

Note. The length, breadth and depth, multiplied into each other, and divided by 94 gives the tonnage; but it is uſual to call the depth half of the breadth.

$$\frac{125\times25\times15}{94} = 498.67+$$ 1ſt ſhip's tonnage.

$$\frac{180.28\times36.05\times21.6}{94} = 1493.4088+$$ 2d ſhip's tonnage.

$$\frac{99.202\times19.84\times11.906}{94} = 249.28738721$$

+3d ſhip's tonnage.

(13) What is the tonnage of a ſhip of 75 feet keel, and 23 feet beam.

$$\frac{23}{2} = 11.5. \text{ ft. depth.}$$

$$\frac{75 \times 23 \times 11.5}{94} = 211 \text{ tons. Anſr.}$$

(14) If a ſhip of 100 tuns be 44 feet long at the keel, of what length ſhall the keel of that ſhip be, whoſe burthen is 220 tuns?

$$\frac{44 \times 44 \times 44 \times 220}{100} = 187404.8$$

$$\sqrt[3]{187404.8} = 57.22592 + \text{ft. Anſr.}$$

To aſcertain the tonnage of a bale, box, &c. multiply the length, breadth, and depth into each other, and divide their product by 40.

(15) In a caſe 5 feet long 5 feet broad, and 5 feet deep, how many cubick feet?

$5 \times 5 \times 5 = 125$ cubick feet. Anſr.

(16) In a bale 4 ft. 4 in. each way, how many cubick feet?

4 ft. 4 in. × 4 ft. 4 in. × 4 ft. 4 in. = 81 ft. 4 in. $5''$ $4'''$ Anſr.

(17) In a caſk 5 feet long, whoſe diameter is 2 feet, how many cubick feet?

$5 \times 2 \times 2 = 20$ cubick feet. Anſr.

(18) In a package whoſe length is 9 ft. 3 in. breadth 8 ft. 8 in. depth 4 ft. 6 in. how many cubick feet?

9 ft. 3 in. × 8 ft. 8 in. × 4 ft. 6 in. = 360 ft. 9 in. Anſr.

(19) Required the tonnage of the aforeſaid caſe, bale, caſk, and package.

$$125 \text{ ft.} + 81 \text{ ft. } 4 \text{ in. } 5'' \, 4''' + 20 \text{ ft.} + 360 \text{ ft. } 9 \text{ in.} = 587 \text{ ft. } 1 \text{ in. } 5'' \, 4'''$$

$$\frac{587 \text{ ft. } 1 \text{ in. } 5'' \, 4'''}{40} = 14 \text{ tons. } 27 \text{ ft. } 1 \text{ in. } 5'' \, 4''' \text{ over.}$$

Anſr.

IN MENSURATION OF CASKS, &c.

Add two thirds of the difference between the bung and head diameters to the head diameter for a mean diameter, which being ſquared and multiplied by .7854 the area of the circle, whoſe diameter is one, gives the area of the mean diameter, or the content of the liquor at one inch deep, which multiplied by the length produces the ſolid inches in the caſk, and divided by as many inches, as are contained in any denomination, you would reduce them to, gives the anſwer.

(20) Suppoſe a caſk in the form of a middle fruſtrum of a ſpheroid, which is the uſual form, in which they are taken, whoſe bung diameter is 31.5, head diameter 24.5, and its length 42 inches, what are the contents in wine gallons each 231 cubick inches?

b.d. h.d. diff.

$$31.5 - 24.5 = 7 \qquad \frac{7 \times 2}{3} = 4.66 \text{ two thirds of diff.}$$

$$24.5 + 4.66 = 29.16$$

$$29.16 \times 29.16 \times .7854 \times 42 = 28048.86076608.$$

$$\frac{28048.86076608}{231} = 121.42363968 \text{ ſolid contents.}$$

Anſr.

To find what quantity of liquor a caſk contains, when lying on its bilge, and not full.

1ſt. Divide the wet, or dry inches by the bung diameter, and if the quotient be under 500, ſubſtract from the quotient a fourth part of that quotient, which would make it 500, and the remainder is a decimal fraction, which muſt be multiplied by the contents.

2dly. But if the quotient be above 500, add to it a quarter part of the exceſs above 500, which ſum multiplied by the caſk's contents gives the liquor in the caſk, if you took the wet inches; but if the dividend was the dry inches, the product is what it wants to fill it up.

(21) Suppoſe the above caſk ſtanding upon its bilge, and has but 16 inches wet in it, let it be required to find, what quantity of wine it contains, and how many gallons will fill it up?

315)16(.507936

$$\frac{.507936-5}{4}+.507936=.50992$$

$.50992 \times 121.4=61.904288$ gals. it contains.

315)15.5(.492063

$$\frac{.5-.492063}{4}=001984$$

$.492063-001984 \times 121.4 = 59.4955906$ gals. vacuity.

$61.904281+59.4955906=121.3998786$ whole contents. Proof.

To find what quantity of liquor a caſk contains when ſtanding on its head, and not full.

Firſt. As the ſquare of half the length of the caſk : is to the difference between the bung, and head areas in gallons: : ſo is the ſquare of the diſtance from the liquor's ſurface to the bung : to a fourth number, or the difference between the bung area and the area of the circle of the liquor's ſurface in gallons.

Secondly. Then from the bung area in gallons, ſubſtract one third of the ſaid difference, or fourth number; multiply the remainder with the liquor's diſtance from the bung, and the product will ſhew the quantity of liquor the caſk wants of being half full, which being ſubſtracted from half the known contents gives the quantity it contains. Note. The fourth number ſubſtracted from the bung's area in gallons ſhews the area of the liquor's ſurface in gallons.

(22) Suppoſe again the above caſk ſtanding on its head, and has 9 inches wet in it, let it be required to find how much wine it contains, and how much is wanting to fill it up?

Length 42÷2×21=441 ſquare of half the length of the caſk.

Length 42÷2—9×12=144 ſq. of diſt. from liquor's ſurf. to the bung.

B. d. 31.5 × 31.5 × ·7854 a. d. 1=779·313150 area of b. d.

H. d. 24.5 × 24.5 × .7854 a. d. = 471.43635 area of h. d.

A. of b. d. 779.31315 ÷ 231 cub. in. in g. = 3.37365 area of b. d. in gals.

A. of h. d. 471.43635 ÷ 231 c. i. in g. = 2.04085 area of h. d. in gals.

B. a. in g. 3.37365—2.04085 h. a. in g. = 1.33280 dif. of areas in gals.

B. a. in g. 3.37365—.4352 dif. of b. and l. a. = 2.93845 area of liq. ſurf. in gals.

Sq. hlf. len. 441 : 1.3328 d. of a. in g : : 144 ſq. of diſt. : .4352 diff. between b. g. and lq. ſurf. area or 4th number.

D. of b. and l. a. .4352 ÷ 3 = .145066 third of 4th number.

B. a. in g. 3.37365 — .145066 $\frac{1}{3}$ of 4th num. = 3.22859 dif. between ar. of b. d. and $\frac{1}{3}$ of 4th num.

Remainder 3.22859 × 21 dry in. — 9 wet in. in 1 hlf. = 38.74308 wants of being hlf. full or prod. of dif. and b. d.

Contents 121.42364 ÷ 2 = 60.71181 half contents.

Hlf. cont. 60.71181 — 38.74308 prod. of dif. and b. d. = 21.96873 gallons it contains, Anſr.

Contents 121.42364—21.96873 gals. in it.

Hlf. cont. 60.71181 + 38.7430 wants of hlf. full. 99.45491 what it wants of being full, and which would have been the quantity of liquor in the caſk, if it had wanted but 9 inches of being full.

In menſuration of ſuperficies, ſuch as ground flooring, paving, tyling, plaiſtering, &c. if it be a four-ſided figure, whoſe oppoſite ſides are equal, multiply the length by the breadth for its contents, and divide the product by the dimenſions given for the anſwer.

(23) In a piece of ground 750 cubits long, and 500 broad, how many biggahs?

750×500 = 375000 ſuperficial cubits,

1 big. = 6400 ſq. cub.) 375000 (58 big. 11 cot. 14 chs. Anſr.

(24) The walls that ſurround my houſe in the form of a perfect ſquare meaſure on each ſide exactly 300 cubits, what quantity of ground do they encloſe?

300×300 = 90000 ſuperficial cubits,

6400) 90000 (14 big. 1 cot. 4 chs. Anſr.

Note. In meaſuring of walls, houſes, &c. it is uſual to indent the ſtring over all the mouldings cloſe round the room, deducting nothing for the vacancy of doors and windows, &c. the length of which muſt be multiplied into the height of the room, taken in the ſame manner as the length; and the uſual rate of charging is 20 rupees per cubick foot, all expences on brick, chunam and labour included; 10 annas in the rupee being allowed for brick-work, &c. and 6 annas for plaiſtering, which makes the charges equal to 12 rs. 8 a. per 100 cubick feet for brick-work, and 3 rs 12 a. per 100 ſquare feet for plaiſtering.

(25) A rectangular four-ſided room meaſures 60 cubits about, and 12 cubits high (allowance being made for girt of cornice, members, doors, windows, &c.) is to be plaiſtered with chunam at

3 rs. 12 a. per hundred ſuperficial feet, required the expence?

Cub. 12=18 ft. cub. 60=90 ft.

$90\times18=1620$ ft.

1620 ft. at 3.75 rs. per 100 ft.=60 rs. 12 a. Anſr.

(26) A gentleman has a bath 12 feet ſquare, paved with marble at 3 rs. 4 a. per ſquare foot, what does it come to?

$12\times12\times3.25=468$ rs. Anſr.

(27) The length of the ſchool-room is 36 cubits, and 16 cubits broad; what will a mat coſt to cover the ſame at 13 ſquare cubits per 1 rupee?

$$\frac{36\times16}{13}=44\tfrac{4}{13}\text{ Anſr.}$$

A three-ſided figure being the half of a four-ſided one of the ſame height and length, multiply the longeſt ſide by its ſhorteſt, and halve it for the contents.

(28) A triangular piece of ground 1000 cubits long, and 750 in the perpendicular, lets for 1 rupee per biggah per month, required the monthly rent, and the value of the ground, ſuppoſing it to yield 20 per cent?

$$\frac{1000\times750}{2}=37500\text{ cubits,}$$

6400)37500(58.59375 per month,

$58.59375\times12=703.125$ per annum.

20 : 100 :: 703.125 : 3515.625 Anſr.

A four-ſided figure, whoſe ſides are not all equal, muſt be divided by a line from corner to corner, the half ſum of which, and the ſum of the perpendiculars multiplied into each other, produce the contents, and if the figure conſiſts of more than four ſides, it muſt be divided into triangles, and wrought as above, the ſum of the areas of each triangle will be the area of the figure.

(29) My garden conſiſting of four unequal ſides is to be diſpoſed of at 60 rupees per biggah; what does the purchaſe money amount to, when the diagonal is 360 cubits in length, and the ſum of the perpendiculars 295 feet?

The half of 360=186

$$\frac{180\times295}{6400}=5\text{ big. }2\text{ cot. }3\text{ chs.}$$

5 big. 2 cot. 3 chs. at 69 rs. per big.=307 rs. 2 a. Anſr.

(30) A yard of rope 9 inches round weighs 12 ſeers, what will a fathom of that weigh, which meaſures 12 inches round?

$$9\times9=81$$

$$12\times12\times2=288$$

81 : 12 : : 288 : 42 ſrs. 10 chs. $\frac{54}{81}$ Anſr,

In menſuration of ſolids, the product of the area multiplied into the depth ſhews the ſolidity.

(31) A ſhip's hold is 112 feet 6 inches long, 32 broad, and 15 ft. 6 in. deep how many bags of rice, ſuppoſing 13½ of them make 1 ton, may be ſtowed therein?

$$112.5\times32\times15.5=55800,$$

94)55800(593.617 tonnage,

593.617×13.5=8013.8295 bags. Anſr.

(32) A ſtone 20 inches long, 15 wide, and 8 deep, weighs 220 pounds, how many cubick feet thereof will freight a ſhip of 300 tons burthen?

20×15×8=2400 inches,

2400 : 220 lbs. : : 1728 : 158.4 lbs. Anſr.

(33) Bought a piece of teak-wood for 1 r. 8 a. the ſuperficial foot, meaſuring 30 feet long, and 16 inches wide, what does the bill come to at that rate?

30×12×16=5760

144)5760(40 ſuperficial feet,

40 ft. at 1 r. 8 a. per foot=60 rupees, Anſr.

(34) Wiſhing to build a wall round my premiſes, which meaſures 200 cubits about, of 9 cubits high, and 2 wide, I would firſt know the expences attending it, my bricklayer informing me, that the uſual charge is 20 rupees per 100 cubick feet?

cub. 200×9×2=12150 feet,

100 : 20 : : 12150 : 2430 rs. Anſr.

(35) Required the expences attending the covering of a houſe with foorkey, &c. that meaſures 85 feet by 40 feet, ſuppoſing it to be charged after the uſual rate, which is 16 ſicca rupees per 100 ſuperficial feet?

85×40=3400

3400 cubits at 16 rs. per 100 ft.=544 rs. Anſr.

SIMPLE

SIMPLE INTEREST.

THE letters made uſe of in Simple Intereſt are theſe:

P. the Principal,
T. the Time,
R. the Ratio of the Rate per Cent,
A. the amount.

Ratio ſignifies only the ſimple intereſt of 1 rupee for 1 year at any propoſed rate of intereſt per cent, and is found thus:

100 : 6 :: 1 : .06
100 : 5 :: 1 : .05

A TABLE OF RATIOS.

Rate per cent.	Ratio.	Rate per cent.	Ratio.
2	.02	7½	.075
3	.03	8	.08
3½	.035	8½	.085
4	.04	9	.09
4½	.045	9½	.095
5	.05	10	.1
5½	.055	10½	.105
6	.06	11	.11
6½	.065	11½	.115
7	.07	12	.12

Note. Any quantity of letters put together like a word denote continual multiplication.

$\overline{2+3}\times5=25$ ſignifies that the ſum of 2 and 3 multiplied by 5 is equal to 25.

$\overline{3-2}\times5=5$ ſignifies that the difference between 3 and 2 multiplied by 5 is equal to 5.

$P\times\overline{r.-1}=A.$ ſignifies that the principal multiplied by the ratio leſs 1 is equal to the amount.

Either $\overline{\qquad}$ $\overline{\qquad}$ $\overline{\qquad}$ $\overline{\qquad}$ placed over any number of figures or letters, ſhew that all within that lunule muſt be wrought by themſelves.

Letters thus ptr denote, that the qualities, which they repreſent, are to be multiplied together.

3 aa+3 a ſignifies 3 times the ſquare of a more 3 times a.

3 aae+3 eea+eee ſignifies 3 times the ſquare of a multiplied by e, more three times the ſquare of e multiplied by e, more the cube of e, as in the Cube Root.

CASE I.

When P. T. and R. are given to find A.

RULE.

$$ptr+p=a.$$

(1) What ſum will 567 rs. 8 a. amount to in 9 years at 6 per cent per annum?

$$567.5\times9\times.06+567.5=873.95=a$$

Anſr. 873.95 rupees amounr.

(2) What will 508 rs. 14 a. amount to in a year at 9 per cent. per annum? Anſr. 554.67375 rupees.

(3) What will 7200 rupees amount to in 6 ½ years at 11 per cent per annum? Anſr. 12348 rupees.

(4) What will 1110 rs. 8 a. amount to in 12¾ years at 10 ½ per cent per annum? Anſr. 2597.181875 rupees.

Note. When the time given, does not conſiſt of whole year's, then reduce the odd time into decimal parts of a year, and unleſs ſuch parts of a year chance to be juſt ¼, ½, or ¾ of a year, the beſt way will be to reduce the odd time into days, and then work with the decimal parts of a year, that are equivalent to thoſe days.

DECIMAL PARTS OF A YEAR.

Days.	Decimal Pts.	Days.	Decimal Pts.
1	.00274	50	.136986
2	.005479	60	.164383
3	.008219	70	.191781
4	.010959	80	.219178
5	.013699	90	.246575
6	.016438	100	.273973
7	.019178	200	.547945
8	.021918	300	.821918
9	.024657	365	1.000000
10	.027397		
20	.054794	¼ of a year	.25
30	.082192	½ of a year	.5
40	.109589	¾ of a year	.75

(5) What will 7200 rupees amount to in 6 $\frac{1}{2}$ years at 5 per cent. per annum? Anſr. 9540 rupees.

(6) What will 1000 rupees amount to in 5 years at 8 per cent per annum? Anſr. 1400 rupees.

(7) What will 280 rs. 12 a. amount to in 3 years 148 days at 12 per cent per annum? Anſr. 395 .48062I2 rs.

(8) What will 1960 rupees amount to in 189 days at 10 per cent per annum? Anſr. 2061.490368 rs.

CASE II.

When A. R. and T. are given to find P.

RULE.

$$\frac{a}{tr+1} = p.$$

(1) I demand what principal will amount to 873 rs. 15 a. 2.40 p. in 9 years at 6 per cent per annum?

$$9 \times .06 + 1 = 1.54$$

$$1.54)567.5(567.5 = p.$$

Anſr. 567.5 rupees principal.

(2) I demand what principal will amount to 554 rs. 10 a. 9.36 p. in 1 year at 9 per cent per annum? Anſr. 508.875 rupees.

(3) I demand what principal being put to intereſt for 6$\frac{1}{2}$ years at 11 per cent will amount to 12348 rupees? Anſr. 7200 rupees.

(4) I demand what principal will amount to 2597 rs.

2 a. 10.98 p. in 12¾ years at 10½ per cent per annum? Anſr. 1110.5 rupees.

(5) I demand what principal will amount to 9540 rupees in 6½ years at 5 per cent per annum? Anſr. 7200 rupees.

(6) What principal will amount to 1400 rupees in 5 years at 8 per cent per annum? Anſr. 1000 rupees.

(7) I demand what principal will amount to 395 rs. 7 a. 8.2792704 p. in 3 years and 148 days at 12 per cent per annum? Anſr. 280.75 rupees.

(8) What principal being put to intereſt for 189 days at 10 per cent per annum will amount to 2061 rs. 7 a. 10.150656 p. Anſr. 1960 rupees.

CASE III.

When A. P. and T. are given to find R.

RULE.

$$\frac{a-p}{tp}=r.$$

(1) At what rate per cent will 567 rs. 8 a. amount to 873 rs. 15 a. 2.40 p. in 9 years?

873.95—567.5=306.45
567.5×9=5107.5
5107.5)306.45(.06=r.
Anſr. 6 per cent.

(2) At what rate per cent will 508 rs. 14 a. amount to 554 rs. 10 a. 9.36 p. in a year? Anſr. 9 per cent.

(3) At what rate per cent will 7200 rupees amount to 12348 rupees in 6$\frac{1}{2}$ years? Anſr. 11 per cent.

(4) At what rate per cent will 1110 rs. 8 a. amount to 2597 rs. 2 a. 10.92 p. in 12$\frac{3}{4}$ years? Anſr. 10$\frac{1}{2}$ per cent.

(5) At what rate per cent will 7200 rupees amount to 9540 rupees in 6$\frac{1}{2}$ years? Anſr. 5 per cent.

(6) At what rate per cent will 1000 rupees amount to 1400 rupees in 5 years? Anſr. 8 per cent.

(7) At what rate per cent will 280 rs. 12 a. amount to 395 rs. 7 a. 8.2792704 p. in 3 years and 148 days? Anſr. 12 per cent.

(8) At what rate per cent will 1960 rupees amount to 2061 rs. 7 a. 10.150656 p. in 189 days? Anſr. 10 per cent.

CASE IV.

When A. P. and R. are given to find T.

RULE.

$$\frac{a-p}{rp}=t.$$

(1) In what time will 567 rs. 8 a. amount to 873 rs. 15 a. 2.4 p. at 6 per cent?

$873.95-567.5=306.45$

$.5675\times.06=34.05$

$34.05)306.45(9=t$

Anſr. 9 years.

(2) In what time will 508 rs. 14 a. amount to 554 rs. 10 a. 9.36 p. at 9 per cent? Anſr. 1 year.

(3) In what time will 7200 rupees amount to 12348 rs. 11 a. at 11 per cent? Anſr. $6\frac{1}{2}$ years.

(4) In what time will 1110 rs. 8 a. amount to 2597 rs. 2 a. 10.92 p. at $10\frac{1}{2}$ per cent? Anſr. $12\frac{3}{4}$ years.

(5) In what time will 7200 rupees amount to 9540 rupees at 5 per cent? Anſr. $6\frac{1}{2}$ years.

(6) In what time will 1000 rupees amount to 1400 rupees at 8 per cent? Anſr. 5 years.

(7) In what time will 280 rs. 12 a. amount to 395 rs. 7 a. 8.2792704 p. at 12 per cent? Anſr. 3 yrs. 148 days.

(8) In what time will 1960 rupees amount to 2061 rs. 7 a. 10.150656 p. at 10 per cent? Anſr. 189 days.

ANNUITIES or PENSIONS

IN ARREARS.

NOTE. U repreſents the annuity, penſion or yearly rent. A. R. T. as before.

CASE I.

When U. R. T. are given to find A.

RULE.

$$\frac{tut-tu}{2}\times 1 : + tu = a.$$

(1) If an annuity of 700 rupees be forborn 5 years, what will it amount to in that time at 12 per cent?

$$5\times700\times5=17500$$

$$5\times700=3500$$

$$17500-3500=14000$$

$$2)14000(7000$$

$$7000\times.12+3500=4340=a.$$

Anſr. 4340 rupees amount.

(2) If the payment of a penſion be omitted for 7 years, what will be the amount in that time at 10 per cent, when the penſion is 5600 rupees? Anſr. 50960 rupees.

Note. When the annuities or rents are to be paid by half-yearly or quarterly payments: For half-yearly payments take $\frac{1}{2}$ of the ratio, $\frac{1}{2}$ of the yearly rent, and twice the number of years; that is, reduce the years into half years, for R. U. and T. but for quarterly payments take $\frac{1}{4}$ of the ratio, $\frac{1}{4}$ of the yearly rent, reduce the years into quarters, and work as before.

(3) If 700 rupees annuity payable every half year were unpaid 5 years; what will it amount to in that time at 12 per cent? Anſr. 4445 rupees.

(4) If 700 rupees annuity payable every quarter were unpaid 5 years; what will it amount to in that time at 12 per cent? Anſr. 4497.5 rupees.

Note. When the payments are monthly, divide the ratio by 12 for R. and proceed as in annual payments; then A. will be equal to the amount for the time given.

(5) An houſe is let upon leaſe for 8 months at 500 rupees per month? I demand the amount for that time at 8 per cent for the forbearance of payment? Anſr. 4093.24 rupees.

(6) Suppoſe a ſalary of 100 rupees per month be forborn 7 months, what is the amount at $4\frac{1}{2}$ per cent? Anſr. 707.875 rupees.

CASE II.

When A. R. T. are given to find U.

RULE,

$$\frac{2a}{trt-tr+2t}=u.$$

(1) If the amount of an annuity for 5 years at 12 per cent be 4340 rupees, what is the annuity?

$$4340\times2=8680$$

$$5\times.12\times5=3 \qquad 5\times2=10$$

$$3-.6=2.4 \qquad 10+2.4=12.4$$

$$12.4)8680(700=u$$

Anſr. 700 rupees annuity.

(2) If the amount of a penſion be 50960 rupees, the time be 7 years, and the rate per cent 10, what is the penſion? Anſr. 5600 rupees.

Note. When the payments are half-yearly 4 a. muſt be divided; but when they are quarterly, then 8 a. muſt be divided; when monthly, r. muſt be divided as before.

(3) If the amount of an annuity payable half-yearly for 5 years at 12 per cent be 4445 rupees, what is the annuity? Anſr. 700 rupees.

(4) If the amount of an annuity payable quarterly for 5 years at 12 per cent be 4497.5 rs. what is the annuity? Anſr. 700 rupees.

(5) If an houſe be let upon leaſe for 8 months, and the amount for that time be 4093 rs. 5 a. 4 p. at 8 per cent: what is the monthly rent? Anſr. 500 rupees.

(6) If a ſalary amounts to 707 rs. 14 a. in 7 months at $4\frac{1}{2}$ per cent, what is the ſalary? Anſr. 100 rupees.

CASE III.

When U. A. and T. are given to find R.

RULE.

$$\frac{2a-2ut}{utt-ut}=r.$$

(1) If an annuity of 700 rupees per annum amounts to 4340 rupees in 5 years, I demand the rate per cent?

$4340 \times 2 = 8680$

$2 \times 700 \times 5 = 7000$

$8680 - 7000 = 1680$

$700 \times 5 \times 5 = 17500$

$700 \times 5 = 3500$

17500—3500=14000
14000)168000(.12=r
Anſr. 12 per cent.

(3) If a penſion of 5600 rupees per annum, amounts to 50960 rupees in 7 years, what is the rate per cent? Anſr. 10 per cent.

Note. When the payments are half-yearly, then 4 a—4 ut muſt be divided, when quarterly 8 a—8 ut muſt be divided, and for monthly payments r. muſt be divided as before.

(3) If an annuity of 700 rupees per annum payable half-yearly be forborn 5 years amounts to 4445 rupees, I demand the rate per cent? Anſr. 12 per cent.

(4) If an annuity of 700 rupees per annum payable quarterly amounts to 4497 rs. 8 a. in 5 years, I demand the rate per cent? Anſr. 12 per cent.

(5) If an houſe be let upon leaſe for 8 months at 500 rupees per month, and the amount for that time be 4093 rs. 5 a. 4 p. what is the rate per cent? Anſr. 8 per cent.

(6) If a ſalary of 100 rupees per month, being forborn 7 months, amounts to 707 rs. 14 a. I demand the rate per cent? Anſr. 4½ per cent.

CASE IV.

When U. A. and R. are given to find T.

RULE.

RULE.

Firſt, $\frac{2}{r} - 1 = x$

Secondly, $\sqrt{\frac{2a}{ru} + \frac{xx}{4}} : - \frac{1}{2}x = t.$

(1) In what time will 700 rupees per annum amount to 4340 rupees forborn at 12 per cent?

.12)2(16.6   16.6—1=15.6

4340×2=8680   700×.12=84

15.6×15.6=243.36   4)243.36(60.84

84)8680(103.33   103.33+60.84=164.17

$\sqrt{^2}$164.17=12.8   2)15.6(7.8

12.8—7.8=5=t

Anſr. 5 years.

(2) In what time will a penſion of 5600 rupees amount to 50960 rupees at 10 per cent? Anſr. 7 years.

Note. If the payments are half-yearly then t will be equal to the number of half years, or payments; but if they were to be made quarterly then t will be equal to the number of quarterly payments; when the payments are monthly t will be equal to the number of monthly payments.

(3) If an annuity of 700 rupees per annum payable half-yearly amounts to 4445 rupees on forbearance at 12 per cent, I demand the time and payments forborn? Anſr. 10 payments=5 years.

(4) If an annuity of 700 rupees per annum payable quarterly, being forborn, amounts to 4497 rs. 8 a. at 12 per cent, I demand the time and payments forborn? Anſr. 20 payments=5 years.

(5) If an houſe be let upon leaſe for a certain time for 500 rupees per month, and the amount be 4093 rs. 5 a. 4 p. at 8 per cent, I demand the time, that it was let for? Anſr. 8 months.

(6) If a ſalary of 100 rupees per month, being forborn a certain time, amounts to 707 rs. 14 a. at $4\frac{1}{2}$ per cent, I demand the time of forbearance? Anſr. 7 months.

PRESENT WORTH
OF
ANNUITIES OR PENSIONS.

NOTE. P. repreſents the preſent worth; U. T. and R. as in the laſt.

CASE I.

When U. T. and R. are given to find P.

RULE.

$$\frac{rtt - rt + 2t}{2rt + 2} : \times u = p.$$

(1) What is the preſent worth of 5000 rupees per annum to continue 6 years at 10 per cent?

$.1 \times 6 \times 6 = 3.6$ $\quad$ $.1 \times 6 = 6$

$3.6 - 6 = 3$ $\quad$ $6 \times 2 = 12$

$$3 + 12 = 15 \qquad 2 \times .1 \times 6 + 2 = 3.2$$

$$3.2)15(4675 \qquad 4.6875 \times 5000 = 23437.5 = p.$$

Anſwer 23437.5 rupees, preſent worth.

(2) What is 800 rupees yearly rent, to continue 5 years worth in ready money, at 12 per cent? Anſ. 3100rs.

(3) What is a ſalary of 4000 rupees per annum, to continue 7 year's worth in ready money, at 8 per cent? Anſwer 22256.4 rupees.

(4) What is a penſion of 300 rupees per month, for 5 months worth in ready money, at $7\frac{1}{2}$ per cent? Anſwer 1472.7 rupees.

Note. Obſerve the ſame note here, which is given in Caſe 1ſt. of Annuities and Penſions in Arrears, concerning half-yearly, quarterly, and monthly payments.

(5) What is the preſent worth of 5000 rupees per annum payable half yearly for 6 years at 10 per cent? Anſr. 23906.25 rupees.

(6) What is the preſent worth of 5000 rupees per annum for 6 years payable quarterly at 10 per cent? Anſr. 24140.625 rupees.

CASE II.

When P. T. R. are given to find U.

RULE.

$$\frac{rt+1}{rtt-rt+2t} : \times 2p = u$$

(1)

(1) There is a leaſe of an houſe 6 years to come; I demand the yearly rent, when the preſent worth at 10 per cent is 23437 rs. 8 a.?

$.1\times6+1=1.6$ $.1\times6\times6=3.6$

$.1\times6=.6$ $6\times2=12$

$3.6-6+12=15$ $15)1.6(.10666+$

$23437.5\times2=46875$ $46875\times.106666=4999.96875\ u$

Anſr. 4999.96875 rupees preſent worth.

(2) What yearly rent is that, the preſent worth of which for 5 years is 3100 rupees at 12 per cent? Anſr. 799.986 rupees.

(3) What ſalary is that, which for 7 years continuance at 8 per cent produces 22256 rs. 6 a. 4.8 p. for the preſent worth? Anſr. 3999 rs. 14 a. 8.679 936.

(4) If the preſent worth of a penſion to continue 5 months at 7½ per cent be 1472 rs. 11 a. 2.4 p. I demand the penſion? Anſr. 299.98899 rupees.

Note. When the payments to be made are half-yearly, you muſt multiply 4 p, but when they are quarterly then multiply 8 p to find u.

(5) There is a leaſe of an houſe payable half-yearly for 6 years to come; I demand the yearly rent, when the preſent worth at 10 per cent is 23906 rs. 4 a.? Anſr. 4999.921875 rupees.

(6) There is a leaſe of an houſe payable quarterly for 6 years to come; I demand the yearly rent, when the preſent worth at 10 per cent is 24140 rs. 10 a.? Anſr. 4999.869375 rupees.

CASE III.

When U. P. and T. are given to find R.

RULE.

$$\frac{\overline{ut - p \times 2}}{2\,pt + ut - utt} = r$$

(1) I demand at what rate per cent will the yearly rent of 5000 rupees, to continue 6 years, produce the preſent worth of 23437 rs. 8 a.?

$5000 \times 6 - 23437.5 = 6562.5$

$6562.5 \times 2 = 13125$ $5000 \times 6 \times 6 = 180000$

$2 \times 23437.5 \times 6 = 281250$ $5000 \times 6 = 30000$

$281250 + 30000 - 180000 = 131250$

131250)13125(.1=r.

Anſr. 10 per cent.

(2) If the yearly rent of 800 rupees per annum, to continue 5 years, bring 3100 rupees preſent worth, what is the rate per cent? Anſr. 12 per cent.

(3) If a ſalary of 4000 rupees per annum, to continue 7 years, produce 22256 rs. 6 a. 4.8 p. for the preſent worth, what is the rate per cent? Anſr. 8 per cent.

(4) If a penſion of 300 rupees per month, to continue 5 months, produce 1472 rs. 11 a. 2.4 p. for the preſent worth, what is the rate per cent? Anſr. $7\frac{1}{2}$ per cent.

Note. When the annuities, &c. are to be paid half yearly or quarterly, then take the half or quarter of U. twice or four times the number of years, and the quotient will be the ratio of either half or a quarter of the rate per cent.

(5) A leaſe of an houſe of 5000 rupees per annum payable half-yearly, having 6 years to come, is ſold for 23906 rs. 4 a. I demand the rate per cent? Anſr. 10 per cent.

(6) A leaſe of an houſe of 5000 rupees per annum payable quarterly, having 6 years to come, is ſold for 24140 rs. 10 a. I demand the rate per cent? Anſr. 10 per cent.

CASE IV.

When U. P. and R. are given to find T.

RULE.

Firſt, $\frac{2}{r} - \frac{2p}{u} - 1 = x$

Secondly, $\sqrt{\frac{2p}{ru} + \frac{xx}{4}} : -\frac{x}{2} =$

(1) If 5000 rupees yearly rent, produce the preſent worth of 23437 rs. 8 a. at 10 per cent, what is the time of its continuance?

Firſt, .1)2(20 $\quad$ 23437.5 × 2 = 46875

5000)46875(9.375 $\quad$ 20 — 9.375 = 10.625

10.625 — 1 = 9.625

Secondly, $5000 \times .1 = 500$ $500)46875(93.75$
$9.625 \times 9.625 = 92.640625$ $2)9.625(4.8125$
$4)92.640625(23.16015625(23.16015625$
$23.16015625 + 93.75 = 116.91015625$
$\sqrt[2]{116.91015625} = 10.8125$
$10.8125 - 4.8125 = 6 = t$
Anſr. 6 years.

(2) I demand how long 800 rupees per annum may be purchaſed for 3100 rupees, at 12 per cent? Anſwer 5 years.

(3) How long muſt a ſalary of 4000 rupees per annum be enjoyed for 22256rs. 6a. 4.8p. at 8 per cent? Anſwer 7 years.

(4) What time may a penſion of 300 rupees per month be bought for 1427rs. at $7\frac{1}{2}$ per cent? Anſwer 5 years.

Note. If the payments are half yearly, then U. will be half of the given leaſe, penſion, &c. and R. will be half the ratio, then T. required will be the number of payments; but if they are quarterly, then U. muſt be a fourth of the annuity, and R. a fourth of the ratio, which will make T. found, the number of quarterly payments, or $\frac{1}{4}$ year.

(5) A leaſe of an houſe of 5000 rupees per annum, payable half yearly is ſold for 23906rs. 4a. at 10 per cent, I demand the number of payments and the time to come? Anſwer 12 payments = 6 years.

(6) A leaſe of an houſe of 5000 rupees per annum, payable quarterly is ſold for 24140rs. 10a. at 10 per cent, I demand the number of payments, and the time to come? Anſwer 24 payments = 6 years.

ANNUITIES

TAKEN IN

REVERSION.

CASE I.

TO find the preſent worth of an Annuity in Reverſion.

RULE.

$$\frac{ttr - tr + 2t}{2tr + 2} \times u = p.$$

p make a. then $\dfrac{a}{tr + 1} = p.$

(1) What is the preſent worth of a leaſe of 300 rupees per month to continue 3 years; but is not to commence 'till the end of two years, allowing 9 per cent to the purchaſer?

$$36 \times 36 \times .0075 = 9.72$$

$$36 \times .0075 = .27 \qquad 36 \times 2 = 72$$

$$9.72 - .27 + 72 = 81.45$$

$$2 \times 36 \times .0075 + 2 = 2.54$$

$$2.54)81.45(32.066929. \times 300 = 9620.07873$$

$$\text{then} \qquad 24 \times .0075 + 1 = 1.18$$

$$1.18)9620.07873(8152.60909 = p.$$

Anſr. 8152.60909 rupees.

(2) I have the promiſe of a penſion of 1700 rupees of 7 years; but it does not commence till the end of 4 years; yet as I am willing to diſpoſe of the ſame for preſent payment at 5 per cent. I would know the preſent worth. What is it? Anſr. 8447.70656 rupees.

(3) A legacy of 2000 rupees per annum is left to a young man of 16 years of age for 8 years, the time of payment commencing at the year of perfection, viz. at his 21ſt year; but as he wants money, is deſirous to diſpoſe of the ſame, at 8 per cent. I wiſh to know the preſent worth? Anſr. 8919.86 rupees.

(4) A good natured gentleman, to beſtow a ſavour upon an unthankful wretch ſettled upon him an income of 3600 rupees per annum for 12 years, to commence 5 years hence, but wanting money to carry on his extravagancies, he diſpoſed of it at 10 per cent, how much ſhould he receive for the preſent payment at that rate? Anſr. 20290.908 rupees.

CASE. II.

To find the yearly income, &c. of an Annuity in Reverſion.

RULE.

$$ptr + p = a$$

change a into p. then

$$\frac{rt + 1}{rtt - rt \times 2t} : \times 2p = u$$

(1) There is a leaſe of an houſe taken for 3 years; but not to commence till the end of 2; the Leſſee would ſell the ſame for 8125 rs. 9 a. 8.94528 p. preſent payment, allowing 9 per cent. to the purchaſer. What is the monthly rent?

$$8152.60909 \times 24 \times .0075 + 8152.60909 = 9620$$
$$.0787262$$

then $36 \times 36 \times .0075 = 9.72. \quad 36 \times .0075 = .27$

$$.27 + 1 = 1.27 \quad 36 \times 2 = 72$$

$$9.72 - .27 + 72 = 81.45$$

$$81.45)1\ 27(.0155923$$

$$9620.0787262 \times 2 \times 0155923 = 300 = u$$

Anſr. 300 rupees nearly.

(2) A perſon having the promiſe of a penſion for 7 years (which does not commence till the end of 4 years) has diſpoſed of the ſame for 8447 rs. 7.0656 a. preſent money, allowing 5 per cent to the purchaſer, what was the penſion? Anſr. 1699.98+rupees.

(3) A perſon of 15 years of age wanting money, ſold a legacy for 8919 rs. 13a. 9.12p. allowing 8 per cent to the purchaſer, as it was not to commence till the age of perfection, I demand the yearly rate? Anſr. 2000 rupees nearly.

(4) A worthy perſon deſirous of beſtowing a favour upon an ungrateful creature, ſettled 12 years annuity upon him, to commence 5 years hence, at 10 per cent per annum for the time; but to carry on his extravagancies he diſpoſed of it for immmediate payment for 20290 rs. 14as. 6.336p. allowing the purchaſer 10 per cent, I demand the yearly rate. Anſr. nearly 3600 rupees.

SIMPLE INTEREST

FOR DAYS.

TO find the ſimple intereſt of any ſum of money for any number of days.

RULE.

Multiply the intereſt of one rupee for one day, at the given rate, by the principal, and by the number of days, the laſt product is the intereſt required.

Note. The intereſt of one rupee for one day at

1	per cent is	.00002739726
2		.00005479452
3		.00008219178
4		.00010958904
5		.0001369863
6		.00016438356
7		.00019178082
8		.00021917808
9		.00024657534
10		.0002739726
11		.00030136986
12		.00032876712

(1) What is the intereſt of 1200 rupees for 126 days at 8 per cent?

.00021917808×1200×126=33.139725696

Anſr. 33 rs. 2 a. 2.827333632 p.

(2) What is the intereſt of 1260 rupees for 145 days at 12 per cent? Anſr. 60.065752824 rupees.

(3) What is the intereſt of 10000 rupees from the 1ſt of June 1787 to the 8th of March following at 10 per cent? Anſr. 769.13a. 9.697152p.

(4) What is the intereſt of 2000 rupees from the 14th Auguſt 1787 to the 19th of December following at 6 per cent? Anſr. 41 rs. 12.05478784a.

(5) What is the intereſt of 500 rupees for 25 days at 10 per cent? Anſr. 3 rs. 6 a. 9.53424 p.

(6) What is the intereſt of 400 rupees for 40 days at 9 per cent? Anſr. 3 rs. 15 a. 1.4794448 p.

REBATE or DISCOUNT.

NOTE. S. repreſents the ſum to be diſcounted,
P. the preſent worth of that ſum,
T. the time before it is due,
R. the ratio or the rate per cent.

CASE I.

When S. T. and R. are given to find P.

RULE.

$$\frac{\text{ſ}}{tr+1}=p$$

(1) What is the preſent worth of 795 rs. 11 a. 2 p. for 11 months at 12 per cent?

$.9166\times.12+1=1.109992$

1.109992)795.697916(716.845631

Anſr. 716.845631 rupees.

(2) What is the preſent worth of 1610 rs. 10 a. for 15 months at 10 per cent? Anſr. 1431.66 rupees.

(3) If a legacy of 10000 rupees is left me the 24th of July 1787 to be paid on Chriſtmas-day following, what muſt I receive when I allow 9 per cent for preſent payment? Anſwer 9638.55979 rupees.

CASE II.

When P. T. and R. are given to find S.

RULE.

ptr + p = ſ.

(1) Suppoſe I receive 716rs. 13a. 6.361152p. now for a ſum of money due 11 months hence, allowing 12 per cent for preſent payment, I demand the ſum that was due at firſt?

716.845631 × .9166 × .12 + 716.845631 = 795.692915644952 = ſ. rupees. Anſr.

(2) There is a certain debt payable 15 months hence; but I agree with the debtor to pay me down 1431 rs. 10 a. 6.72 p and allow him 10 per cent for preſent payment; I demand how much the debt is? Anſr. 1610.6175 rupees.

(3) A legacy was left me on the 24th of July 1787, to be paid on the Chriſtmas-day following; but I agree with the executor, and allow him 9 per cent for the preſent payment of 9638 rs. 8 a. 11.47968p. I demand what the legacy was? Anſr. 10000 rupees.

CASE III.

When S. P. and R. are given to find T.

RULE.

$$\frac{s-p}{rp}=t.$$

(1) The preſent worth of 795 rs. 11 a. 2 p. due for a certain time to come is 716 rs. 13 a. 6.361152 p. at 12 per cent: I demand, in what time the firſt ſum ſhould have been paid, if no rebate had been made?

$$795.697916-716.845631=78.852285$$
$$716.845631\times.12=86.02147572$$
$$86.02147572)78.852285(.9166=t.$$

Anſr. 11 months nearly.

(2) There is 1610 rs. 10 a. due at a certain time to come; but I allow 10 per cent to the debtor for the preſent payment of 1431 rs. 10 a. 6.72 p. I demand, when they ſhould have been paid without any rebate? Anſr. 15 months.

(3) I have received 9638 rs. 8 a. 11.47968 p. for a legacy of 10000 rupees, allowing the executor 9 per cent; I demand when the legacy was payable without rebate? Anſr. 5 months nearly.

CASE IV.

When S. P. and T. are given to find R.

RULE.

$$\frac{ſ-p}{tp}=r.$$

(1) At what rate per cent will 795 rs. 11 a. 2 p. payable 11 months hence, produce 716.845361 rupees for preſent payment?

795.697916—716.845631=78.852285
716.845631×.9166=657.0607053746
657.0607053746)78.852285).12=r.
Anſr. 12 per cent.

(2) At what rate per cent will 1610 rs. 10 a. payable 15 months hence. produce the preſent payment of 1431 rs. 10 a. 6.72 p.? Anſr. 10 per cent.

(3) Suppoſe a legacy of 10000 rupees is left me the 24th of July 1788 to be paid on the Chriſtmas-day following; but I agree with the executor for the preſent payment of 9638 rs. 8 a. 11.47968 p. I demand the rate per cent allowed for his money? Anſr. 9 per cent.

EQUATION of PAYMENTS.

RULE.

FIND the preſent worth of each payment for its reſpective time: thus

$$\frac{ſ}{tr+1}=p.$$

Add all the preſent worths together, which ſum call P. then is ſ—p=d the rebate.

$$\frac{d}{pr}=e,$$ the true equated time.

(1) A. owes B. 2000 rupees to be paid as follows, viz. 1000 rupees at 2 months; and 1000 rupees at 4 months; but they agree to have but one payment of the whole; rebate being made at 6 per cent. I demand the true equated time?

.166×.06+1 =1.00996

1.00996)1000(990+

.333×.06+1 =1.01998

1.01998)1000(980+

990+980=1970 2000—1970=30

1970×.06=118.2 118.2)30(.2538

.2538×12=3.0456=e. Anſr. 3.0456 months.

(2) A merchant hath owing him 3000 rupees to be paid as follows: 500 rupees at 2 months, 1000 rupees at 5 months, and the reſt at 8 months, and it is agreed to have but one payment of the whole, rebate being made at 5 per cent, I demand the equated time? Anſr. 4.9796 months.

(3) F. owes H. 1000 rupees whereof 200 rupees is to be paid preſent, 400 rupees at 5 months, and the reſt at 10 months; but they agree to have but one payment of the whole, at the rate of 4 per cent rebate. I demand the true equated time? Anſr. 181.11615225 days.

(4) D. owes E. 8000 rupees, whereof 2000 rupees is to be paid in 3 months, 2000 rupees at 4 months, and 4000 at 6 months; but they agreeing to make

but one payment of the whole at the rate of 5 per cent rebate, the true equated time is demanded? Anſr. 4.7436 months.

(5) E. owes F. 1200 rupees, which is to be paid as follows: 200 rupees down, 500 rupees at the end of 10 months, and the reſt at the end of 20 months; but they agree to have but one payment of the whole, rebate at 3 per cent, the true equated time is demanded? Anſr. 1 yr. 11.3953 days.

COMPOUND INTEREST.

THE letters made uſe of in Compound Intereſt are

A. the amount,
P. the principal,
T. the time,
R. the amount of 1 rupee for 1 year,

at any given rate, which is thus found:

As 100 : 105 : : 1 : 1.05   As 100 : 105.5 : : 1 = 1.055

A Table of the amount of 1 rupee for 1 year.

Rates per cent.	Amounts of 1 rupee.	Rates per cent.	Amount of 1 rupee.
2	1.02	7 ½	1.075
2 ½	1.025	8	1.08
3	1.03	8 ½	1.085
3 ½	1.035	9	1.09
4	1.04	9 ½	1.095
4 ½	1.045	10	1.10
5	1.05	10 ½	1.105
5 ½	1.055	11	1.11
6	1.06	11 ½	1.115
6 ½	1.065	12	1.12
7	1.07		

CASE I.

When P. T. R. are given to find A.

RULE.

$$p \times rt. = a.$$

Note. R. muſt be involved ſo many times as the number of years direct, and that will be rt.

(1) What ſum will 4500 rupees amount to in four years time at 5 per cent per annum?

$$1.05 @ 3 = 1.157625$$

$$1.157625 \times 4500 = 5209.3125 = a.$$

Anſr. 5209rs. 5a.

(2) What will 4000 rupees amount to in 4 years at 12 per cent per annum? Anſr. 6294.07744 rupees.

3) What will 4800 rupees amount to in 5 years time at 10 per cent per annum? Anſr. 7730.448 rupees.

(4) What is the amount of 5000 rupees at $10\frac{1}{2}$ per cent for 6 years? Anſr. 9102.1433+rupees.

CASE II.

When A. R. and T. are given to find P.

RULE.

$$\frac{a}{rt.} = p.$$

(1) What principal muſt be put to intereſt to amount to the ſum of 5209 rs. 5 a. in 3 years at 5 per cent?

1.05

$1.05 \ominus 3 = 1.157625$

1.157625)5209.3125(4500=p.

Anſr. 4500 rupees.

(2) What principal will amount to 6294 rs. 1 a. 2.86848 p. in 4 years at 12 per cent? Anſr. 4000 rupees.

(3) What principal will amount to 7730 rs. 7 a. 2.016 p. in 5 years at 10 per cent? Anſr. 4800 rupees.

(4) What principal will amount to 9102 rs. 2 a. 3.529309815p. in 6 years at 10$\frac{1}{2}$ per cent? Anſr. 5000 rupees.

CASE III.

When P. R. and A. are given to find T.

RULE.

$\frac{a}{p}$=rt. which muſt be continually divided by r. till nothing remains, and then the number of diviſions will be t.

(1) In what time will 4500 rupees amount to 5209 rs. 5 a. at 5 per cent per annum?

4500)5209.3125(1.157625=rt.

1.05)1.157625(1.1025

1.05)1.1025(1.05 1.05)1.05(1

Anſr. the number of diviſions being 3 is equal to the time ſought.

(2) In what time will 4000 rupees amount to 6294 rs. 1a. 2.86848 p. at 12 per cent per annum? Anſr. 4 years.

(3) In what time will 4800 rupees amount to 7730 rs. 7 a. 2.016 p. at 10 per cent? Anſr. 5 years.

(4) In what time will 5000 rupees amount to 9102 rs. 2 a. 3.5293098 15 p. at 10½ per cent per annum? Anſr. 6 years.

CASE IV.

When P. A. and T. are given to find R.

RULE.

$\frac{a}{p}$=rt. which muſt be extracted by the rules of extraction, the time given in the queſtion=t. ſhewing the power.

(1) At what rate per cent will 4500 rupees amount to 5209 rs. 5 a. in 3 years?

$$4500)5209.3125(1.157625=rt.$$

$$\sqrt[3]{1.157625}=1.05$$

Anſr. 5 per cent.

(2) At what rate per cent. will 4000 rupees amount to 6294 rs. 1 a. 2.86848 p. in 4 years? Anſr. 12 per cent.

(3) At what rate per cent. will 4800 rupees amount to 7730 rs. 7 a. 2.016 p. in 5 years? Anſr. 10 per cent.

(4) At what rate per cent. will 5000 rupees amount to 9102 rs. 2 a. 3.5293098 15 p. in 6 years? Anſr. 10 ½ per cent.

ANNUITIES or PENSIONS

IN ARREARS.

NOTE. U repreſents the annuity, penſion, &c. T. R. and A. as before

CASE I.

When U. T. and R. are given to find A.

RULE.

$$\frac{urt-u}{r-1}=a$$

(1) What will an annuity of 300 rupees per annum payable yearly amount to in 4 years at 5 per cent.

1.05 ⊙ 4=1.21550625   1.21550625×300=364.651875.

364.651875—300=64.651875   1.05—1=.05

.05)64.651875(1293.0375=a

Anſr. 1293.0375 rupees.

(2) Suppoſe a penſion of 5000 rupees per annum payable yearly be granted to a ſuperannuated officer, what is the amount for 5 years for forbearance at 8 per cent? Anſr. 29333.0048 rupees.

(3) If the monthly rent of a houſe, which is 400 rupees, be forborn 7 months at 6 per cent, what is the amount? Anſr. 2842.35175+rupees.

(4)

(4) If a ſalary of 4200 rupees per annum to be paid monthly be omitted for 6 months, at 12 per cent, what is the amount? Anſr. 2153.205271+rupees.

CASE II.

When R. T. and A. are given to find U.

RULE.

$$\frac{ra-a}{rt.-1}=u.$$

(1) What annuity being forborn for 4 years, will amount to 1293 rs. 0 a. 7.2 p. at 5 per cent?

$$1.05\times1293.0375=1357.689375$$
$$1357.689375-1293.0375=64.651875$$
$$1.05 \circledcirc 4=1.21550625$$
$$1.21550625-1=.21550625$$
$$.21550625)64.651875(300=u.$$

Anſr. 300 rupees.

(2) If a penſion being forborn for 5 years at 8 per cent per annum amount to 29333.0048 rupees, I demand how much it is per annum? Anſr. 5000 rupees.

(3) If the monthly rent of a houſe being forborn 7 months at 6 per cent, amount to 2842 rs. 5 a 7.5370096812 p. I demand what is the rent? Anſr. 400 rupees.

(4) If the payment of a ſalary be omitted 6 months, I demand how much the ſalary is, when the amount

is 2153 rs. 3 a. 3.41203872 p. at 12 per cent? Anſr. 350 rupees per month.

CASE III.

When U. A. and R. are given to find T.

RULE.

$\frac{ar+u-a}{u}=rt.$ which muſt be repeatedly divided by r. till nothing remains, and the number of diviſions will be = t.

(1) In what time will 300 rupees per annum amount to 1293 rs. 0 a. 7.2 p. allowing 5 per cent for the forbearance of payment?

$$1293.0375\times1.05=1357.689375$$
$$1357.689375+300-1293.0375=364.651875$$
$$300)364.651875(1.21550625=rt.$$
$$1.05)1.21550625(1.157625 \qquad 1.05)1.157625(1.1025$$
$$1.05)1.1025(1.05 \qquad 1.05)1.05(1$$

Anſr. 4 years, being the number of diviſions.

(2) In what time will a penſion of 5000 rupees per annum amount to 29333.0048 rupees at 8 per cent? Anſr. 5 years.

(3) In what time will the monthly rent of an houſe, being 400 rupees per month, amount to 2842 rs. 5 a. 7.5370096812 p. at 6 per cent for non-payment? Anſr. 7 years.

(4)

(4) In what time will a ſalary of 4200 rupees per annum, payable monthly, amount to 2153 rs. 3 a. 3.41203872 p. at 12 per cent for the forbearance of payment? Anſr. 6 years.

PRESENT WORTH

OF

ANNUITIES, PENSIONS, &c.

NOTE. P. is the preſent worth, U. T. and R. as in the laſt.

CASE. I.

When U. T. and R. are given to find P.

RULE.

$$\frac{u - \frac{u}{rt}}{r - 1} = p$$

(1) What is the yearly rent of 200 rupees to continue 6 years worth in ready money at 5 per cent?

105©6=1.340095640625

1.340095640625)200(149.2430793273255

200—149.2430793273255=50.7569206726745

1.05—1=.05

.05)50.7569206726745(1015.138413453149=p.

Anſr. 1015.1384+ rupees.

(2)

(2) What is the preſent worth of a penſion of 300 rupees per annum for 5 years at 8 per cent? Anſr. 1197.81301125 rupees.

(3) What muſt be the diſcount of a leaſe of 500 rupees per annum, when the preſent payment is made for 4 years at 12 per cent? Anſr. 481.325327 rupees.

(4) A houſe is let upon leaſe for 4 months at 700 rupees per month and the leſſee is deſirous to make preſent payment, provided the leſſor will allow him $8\frac{1}{4}$ per cent, I demand, how much muſt be paid down, and how much diſcounted? Anſr. 2752.528851 rupees paid down and 47.4711419 rupees diſcounted.

CASE II.

When P. T. and R. are given to find U.

RULE.

$$\frac{\overline{prt \times r} - prt}{rt - 1} = u$$

(1) What annuity or yearly rent to continue 6 years may be purchaſed for 1015 rs. 2 a. 2.57664 p. at 5 per cent?

$$10.5 \odot 6 = 1.340093640625$$

$$\begin{array}{r} 1015.13842 \\ \hline 1360.38257127295031250 \end{array}$$

1360.38

```
          1360.38257127295031250
                            1.05
          ----------------------
        1428.4016998365978281250
        1360.382571272950312500
        ------------------------
340095640625).. 68.0191285636475156250(200
                =u.
```

Anſr. 200 rupees.

Suppoſe the preſent payment of 1197rs. 13.00816a. was required for a penſion for 5 years to come at 8 per cent, what is the penſion? Anſr. 400 rupees.

(3 If the preſent payment of 1518.674673 rupees be made for the leaſe of a houſe for 4 years to come at 12 per cent, what is the yearly rent? Anſr. 500 rupees nearly.

(4) If a houſe is let upon leaſe for 4 months, and the leſſee makes preſent payment of 2752.5288581 rupees for that time at $8\frac{1}{4}$ per cent, what is the yearly rent of that houſe? Anſr. 700 rupees.

CASE III.

When U. P. and R. are given to find T.

RULE.

$\frac{u}{p+u-pr}=rt.$ which being continually divided by r. till nothing remains, the number of thoſe diviſions will be$=$t.

(1)

(1) How long may a leaſe of 200 rupees yearly rent be had for 1015 rs. 2 a. 2.57538307008 p. allowing 5 per cent to the purchaſer ?

$$1015.13841345349 \times 1.05 = 1065.8953341261645$$

$$1015.13841345349 + 200 - 1065.8953341262645 =$$

$$149.2430793273255$$

$$\frac{200}{149.2430793273255} = 1.340095640625 +$$

1.05)1.340095640625(1.2762815625

1.05)1.276285625(1.21550625

1.05)1.21550625(1.157625

1.05)1.157625(1.1025

1.05)1.1025(1.05

1.05)1.05(1

Anſr. 6 years, being equal to the number of diviſions.

(2) I demand what time a leaſe of 300 rupees per annum may be purchaſed for, when preſent payment of 1197rs. 13.00818 a. is made at 8 per cent. Anſr 5. years.

(3) If 1518.67467333 rs. be paid down for a leaſe of 500 rs. per annum at 12 per cent, how long is the leaſe purchaſed for. Anſr. 4 years.

(4) A houſe is let upon leaſe for 700 rs. per month, and the leſſee makes payment of 2752.5288581 rupees, he being allowed 8¼ per cent, I demand how long the leaſe is purchaſed for ? Anſr. 4 months.

OF

OF ANNUITIES, &c.
TAKEN IN
REVERSION.

TO find the preſent worth of an aunnity, &c.

CASE I.

U. T. and R. are given to find P.

RULE.

$$\frac{u - \frac{u}{rt.}}{r - 1} = p.$$

Call p. a. then a. r. and t. will be given to find p.

RULE.

$$\frac{a}{rt.} = p.$$

Note. To prove theſe queſtions exactly, the remainder after diviſion muſt be taken in, where the reſpective operations anſwer each other in the following caſes.

(1) What is the preſent worth of the reverſion of a leaſe of 200 rupees per annum to continue 6 years, but not to commence 'till the end of 2 years, allowing 5 per cent to the purchaſer?

1.05.Ⓖ6=1.340095640625

1.340095640625)200(149.2430793273255

1.05—1=.05 1.05×1.05=1.1025

200

149.2430793273255

.05) 50.7569206726745

1.1025)1015.138413453349(920.7604657=p.

Anſr. 920.76+rupees.

(2) There is a leaſe of certain lands worth 300 rupees per annum, which is yet in being for 3 years, and the leſſee is deſirous to take a leaſe in reverſion for 5 years, to begin when the old leaſe ſhall be expired; I demand the preſent worth of the ſaid leaſe in reverſion, allowing 8 per cent to the purchaſer? Anſr. 950.86 rupees.

(3) There is a houſe now building, which I have a mind to take a leaſe of for 4 years; but will not be finiſhed within 2 years; I demand how much I muſt pay down, when the yearly rent is 500 rupees, and the landlord affords me 12 per cent? Anſr. 1210.678 rupees.

C A S E II.

To find the yearly income of an annuity, &c.

R U L E.

prt.=a

Change a. into p. then.

$$\frac{\overline{\text{prt.} \times r} - \text{prt.}}{\text{rt.} - 1} = u. \qquad (1)$$

(1) What annuity, or yearly rent, to be entered upon 2 years hence, and then to continue 4 years, may be purchaſed for 920 rs. 12 a. 2.0094144 p. ready money at 5 per cent?

920.7604657 × 1.1025 = 1015.13841343425
1.05   6 = 1.340095640625

1360.38256447421736006640625
1.05

1428.4016926979282280697265625
1360.382564474217360066406250

.340095640625). 68.0191282337108680033203125(200 = u.

Anſr. 200 rupees.

(2) There is a leaſe of certain lands in being for 3 years, and the leſſee being minded to take a leaſe in reverſion for 5 years, to begin when the old leaſe ſhall be expired, laid down 950 rs. 13 a. 9.12 p. I demand the yearly rent of the ſaid lands, when allowance was made to the leſſee at 8 per cent? Anſr. 300 rupees.

(3) The preſent payment for the leaſe of an houſe is 1210 rs. 10 a. 10.176 p. now I have taken a leaſe in reverſion for 4 years, which is to commence at the end of 2 years, I demand how much the yearly rent is, when for the ſaid preſent payment I was allowed 12 per cent? Anſr. 500 rupees nearly.

CASE III.

To find the time.

R U L E.

$$prt=a$$

Change a. into p. then. $\dfrac{u}{p+u-pr}$ = rt. which being continually divided by r. till nothing remains, the number of theſe diviſions will be=t.

(1) The preſent worth of a certain leaſe in reverſion is 920 rs. 12 a. 2.0094144 p. the leaſe is 200 rupees per annum, and commences 2 years hence, and the allowance to the purchaſer is 5 per cent, I demand the time of its continuance?

920.7604657×1.1025=1015.13841343425

1015.13841343425	1015.13841343425
200	1.05
1215.13841343425	1065.8953341059625
1065.8953341059625	
.149.2430793282875	

149.2430793282875)200(1.340095640625
1.05)1.340095640625(1.2762815625
1.05)1.2762815625(1.21550625
1.05)1.21 50625(1.157625
1.05)1.157625(1.1025
1.05)1.1025(1.05
1.05)1.05(1

Anſr. 6 years being equal to the number of diviſions.

(2) A certain man took a leaſe of ſome lands for a time, which by agreement was not to commence till the expiration of 3 years, the yearly rent was 300 rupees,

pees, it was alſo agreed, that the purchaſer ſhould lay down 950 rs. 13 a. 9.12 p. and be allowed for his preſent payment, 8 per cent, I demand the time, that the leaſe was taken for? Anſr. 5 years being equal to the number of diviſions.

(3) The preſent payment for the leaſe of an houſe is 1210 rs 10 a. 10.176 p. and the yearly rent is 500 rupees, now I have taken a leaſe in reverſion, which is to commence at the end of 2 years, I demand the length of the leaſe, when I was allowed 12 per cent? Anſr. 4 years being equal to the number of diviſions.

FREEHOLD ESTATES,

OR SUCH AS CONTINUE FOR EVER.

NOTE. U. repreſents the yearly rent,
R. the amount of 1 rupee, &c. &c.
P. the preſent worth.

CASE I.

When U. and R. are given to find P.

RULE.

$$\frac{u}{r-1}=p.$$

(1) Suppoſe a freehold eſtate of 400 rupees per annum is to be ſold, what is it worth, allowing the buyer 5 per cent for his money?

1.05

$$1.05-1=.05$$

$$.05)400(8000=p.$$

Anſr. 8000 rupees.

(2) What is an eſtate of 2900 rupees per annum, to continue for ever, worth in preſent money, allowing 12 per cent to the purchaſer? Anſr. 24166 .6666 rupees.

CASE II.

When P. and R. are given to find U.

RULE.

$$p \times \overline{r-1} = u.$$

(1) If a freehold eſtate is bought for 8000 rupees, and the allowance of 5 per cent is made to the buyer, I demand the yearly rent?

$$1.05-1=.05$$

$$8000 \times .05 = 400 = u.$$

Anſr. 400 rupees.

(2) If an eſtate be ſold for 24166rs. 10a. 7.99872p. preſent money, and 12 per cent is allowed to the buyer for the ſame, I demand the yearly rent? Anſr. 2900 rupees nearly.

CASE. III.

When P. and U. are given to find R.

RULE.

RULE.

$$\frac{p+u}{p} = r.$$

(1) If a real eſtate of 400 rupees per annum be ſold for 8000 rupees, I demand the rate per cent.

$$8000 + 400 = 8400$$
$$8000)8400(1.05 = r.$$

Anſr. 5 per cent.

(2) If a freehold eſtate of 2900 rupees be bought for 24166rs. 10a. 7.99872 p. I demand the rate per cent allowed? Anſr. 12 per cent.

FREEHOLD ESTATES,
IN REVERSION.

CASE I.

To find the preſent worth.

RULE.

$$\frac{u}{r-1} = p.$$

Let p be changed into a.

$$\text{then } \frac{a}{r^t} = p.$$

(1)

(1) Suppoſe a freehold eſtate of 400 rupees per annum, to commence 3 years hence, is to be ſold, what is it worth, allowing the purchaſer 5 per cent for his preſent payment?

$1.05-1=.05$ $\quad .05)400(8000$

1.05 @ $3=1.157625$

$1.157625)8000(6910.7=p.$

Anſr. 6910.7 rupees.

(2) What is an eſtate of 2900 rupees per annum, to continue for ever, but not to commence till the expiration of 2 years, worth in preſent money, allowance being made at 12 per cent? Anſr. 19265.5187 rupees.

CASE II.

To find the amount of the preſent worth.

RULE.

$$pr^t = a$$

Let a. be changed into p.

Then

$$\frac{\overline{pr\times r}-pr}{r}=u.$$

(1) Suppoſe a freehold eſtate, to commence 3 years hence, is ſold for 6910 rs. 11 a. 2.4 p. allowing the purchaſer 5 per cent, I demand the yearly income?

1.05 @ $3=1.157625$

$1.157625\times 6910.7=7999.9990875$

$7999.9990875 \times 1.05 \times 1.05 - 8399.999041875 =$
419.99995209375

$1.05)419.99995209375(400 = u.$

Anſr. 400 rupees nearly.

(2) There is a certain freehold eſtate bought for 19265 rs. 8 a. 3.5904 p. which does not commence till the expiration of 2 years, the buyer was allowed 12 per cent for his money, I demand the yearly income? Anſr. 2900 rupees nearly.

REBATE or DISCOUNT.

NOTE. In Rebate or Diſcount the letters S. P. T. and R. are made uſe of, and denote

S. the ſum to be diſcounted for,

P. the preſent worth of that ſum, due at any time to come,

T. the time before it becomes due, &c.

R. the amount of 1 rupee for 1 year, at any rate per cent.

CASE I.

When S. T. and R. are given to find P.

RULE.

$$\frac{ſ}{rt} = p.$$

(1) What is the preſent worth of 463 rs. 0 a. 9.6 p. payable 3 years hence at 5 per cent?

1.05 @ 3=1.157625

1.157625)463.05(1.00=p.

Anſr. 400 rupees.

(2) There is a debt of 635 rs. 3 a. 4.51104 p. which is not due until 4 years hence; but is agreed to be paid in preſent money; what ſum muſt the creditor receive, allowing the rebate of 9 per cent to the debtor for his money? Anſr. 450 rupees.

(3) If 896 rs. 14 a. 6.977777661 p. be payable in 6 years time, what is the preſent worth, rebate being made at 12 per cent? Anſr. 500 rupees.

CASE II.

When P. T. and R. are given to find S.

RULE.

p × rt=ſ.

(1) If 400 rupees be received for a debt payable 3 years hence, and an allowance of 5 per cent was made to the debtor for his preſent payment, I demand what the debt was?

1.05@3=1.157625

1.157625×400=463.05 ſ.

Anſr. 463 05 rupees.

(2) There is a ſum of money due at the expiration of 4 years, but the creditor agrees to take 450 rupees down, allowing 9 per cent on preſent payment, I demand what the debt is? 635.2117245 rupees.

(3)

(3) If a ſum of money due 6 years hence produces 500 rupees for preſent payment: rebate being made at 12 per cent, I demand, how much the debt was? Anſr. 986.211342592 rupees.

CASE III.

When S. P. and R. are given to find T.

RULE.

$\frac{ſ}{p}$=rt. which being continually divided by r. till nothing remains, the number of thoſe diviſions will be=t.

(1) A certain man received 400 rupees down for a debt of 463 rs. 0 a. 9.6 p. rebate being made at 5 per cent?

400)463.05(1157625=rt

1.05)1.157625(1.1025   1.05)1.1025(1.05

1.05)1.05(1 Anſr. 3 years.

(2) There is a debt of 635rs. 3a. 4 651104p. payable at a certain time; but it is agreed to pay 450 rupees down at the allowance of 9 per cent to the debtor for his preſent money, I demand in what time the debt would become due, if no ſuch payment was to be made? Anſr. 4 years.

(3) The preſent payment of 500 rupees is made for a debt of 986rs. 14a. 6.977777664p. rebate at 12 per cent, I demand when the debt is payable. Anſr. 6 years hence.

CASE IV.

When S. P. and T. are given to find R.

RULE.

$\frac{s}{p} = rt.$ Which muſt be extracted by the rules of extraction, the time given in the queſtion = t ſhewing the power.

(1) The preſent worth of 463rs. ca. 9.6p. payable 3 years hence is 400 rupees, I demand at what rate per cent rebate is made?

$$400)463.05(1.157625 = rt.$$

$$\sqrt[2]{1.157625} = 1.05.$$

Anſwer 5 per cent.

(2) A debt of 635rs. 3a. 4.651104p. will be due 4 years hence, but it is agreed to take 450 rupees, what is the rate per cent, that the rebate is made at? Anſr. 9 per cent.

(3) The ſum of 986rs. 14a. 6.977777664p. is payable in 6 years time, and the preſent payment of that ſum is 500 rupees, I demand at what rate per cent muſt rebate be made to produce the ſaid preſent worth? Anſr. 12 per cent.

ADDITIONAL

ADDITIONAL QUESTIONS,

FOR EXERCISE.

WHAT number is that which being multiplied by 13, the product will be 221? Anſr. 17.

(2) If $\frac{3}{8}$ of a ſhip be worth 3740 rupees, what is the whole worth? Anſr. 9973 rs. 5 a. 4 p.

(3) What is the amount of 1000 rupees for 5 years at $4\frac{3}{4}$ per cent, ſimple intereſt? Anſr. 1261 rs. 4a.

(4) A young man received 210 rupees, which was $\frac{2}{3}$ of his elder brother's portion: now three times the elder brother's portion was half of his father's eſtate: I demand how much the eſtate was? Anſr. 1890 rupees.

(5) If a tower be 384 feet high from the foundation, and a ſixth part under the earth, and an eighth part be under the water, how much in height is viſible? Anſr. 272 feet.

(6) A gentleman having 50 annas to pay among his coolies for a day's labour, would give ſome 6 pice and ſome 8 pice, and ſome 16 pice; the number in each claſs were equal. I demand the number of each? Anſr. 20 in each claſs.

(7) If 48 taken from 120 leaves 72, and 72 taken from 91 leaves 19, and 7 taken from thence leaves 12; what number is that, out of which when you have taken 48, 72, 19, and 7, leaves 12? Anſr. 158 rupees.

(8) What ſum muſt be added to 1014206 to make it fifty millions? Anſr. 48985794.

(9) There are in 3 bags the ſum of 1468 rupees, viz. in the firſt bag 461 rupees, in the ſecond bag 581 rupees; I demand what was in the third bag? Anſr. 426 rupees.

(10) What is the difference between twice 8 and 40, and twice 48? Anſr. 40.

(11) Will and Frank talking of their ages, in the year 1749, Will ſaid he was born in the year of the rebellion (in 1715), and Frank ſaid he remembered he was 10 years old, the year King George the Second was crowned (in 1727): required the age of each, and the difference of their ages? Anſr. Will's age 34, Frank's age 32, and difference of age 2 years.

(12) Six meſſmates, who propoſe to live well, during an Eaſt India voyage of 22 months, agree to ſpend among them 5 rupees per day, beſides the ſhip's allowance: Now one of them having but 25 rupees a month, how will the matter ſtand with him at the end of the voyage? Anſr. he will clear but 36 rs. 10 a. 8 p.

(13) What number multiplied by 57 will produce juſt what 134 multiplied by 71 will do? Anſr. $156\frac{52}{57}$.

(14) A perſon dying left his widow 17800 rupees, and 12500 rupees to each of his four children, 50 gold mohurs a piece to 15 of his poor relations, and 1500 rupees in charities; he had been $25\frac{1}{2}$ years in trade, and at an average cleared 2260 rupees; what had he to begin with? Anſr. 23670 rupees.

(15)

(15) The globe of the earth under the line is 360 degrees in circumference, each degree 69½ miles; and this body turning on its own axis in 23 hours 56 minutes, at what rate an hour are the inhabitants of Bencoolen ſituated under the line, carried about from weſt to eaſt by this rotation? Anſr. 10455 miles.

(16) A fellow was ſaying, that when he told over his baſket of mangoes 2 by 2, 3 by 3, 4 by 4, 5 by 5, or 6 by 6, there ſtill came an odd one; but when he told them 7 by 7, there came even. Anſr. 721.

(17) There are two numbers, whoſe product is 1610, the greater is given 46; what is the ſum of their ſquares, and what the cube of their difference? Anſr. 3341 ſum of their ſquares, and 1331 cube of difference.

(18) A lady had 5 children born 3 years after each other; the eldeſt was born when ſhe was 19 years old, which is now the age of the youngeſt. How old is the lady? Anſr. 62 years of age.

(19) Suppoſe a ſhip ſails 5½ miles an hour for 14 days, how many degrees and minutes has ſhe ſailed in the whole, 60 ſea miles make 1 degree? Anſr. 30 deg. 48 m.

(20) A. B. and C. trade in company; and making up accounts, it appears that A. and B. together gained 1310 rupees, B. and C. together 1212 rupees, and A. and C. together gained 1116 rupees, what did they ſeverally gain? Anſr. A. gained 607 rupees, B. 703, and C. 509.

(21) There is a maſt or pole, 12 feet ſtands in the ground, 8 times that length in the water, and 9 times its length in the air or above the water; I demand the whole length? Anſr. 216 feet length.

(22) A. and B. traded together, and gained 1000 rupees: A. put in 6400 rupees, B. put in ſo much that he muſt receive 600 rupees of the gain: I demand how much B. put in? Anſr. 9600 rupees.

(23) What quantity of water muſt I add to a pipe of Madeira wine worth 336 rupees, to reduce the firſt coſt to 7 rupees per dozen, ſuppoſing the pipe to contain 42 dozens? Anſr. 6 dozens of water.

(24) What difference is there between the intereſt of 500 rupees at 10 per cent for 12 years, and the diſcount of the ſame ſum, at the ſame rate, and for the ſame time? Anſr. 327.28 rupees advantage by the intereſt.

(25) If 12 mangoes are worth 21 roſe-apples, and 3 roſe-apples coſt 1 pice, what is the price of 4 ſcore and 4 mangoes? Anſr. 4 a. 1 p.

(26) Three merchants A. B. and C. have gained 234 rupees, which they are to divide ſo, that when the profit of A. is multiplied by 2, that of B. by 3, and C.'s by 4, their products are to be equal, I demand how much each of them are to receive? Anſr. A. 108, B. 72, and C. 54.

(27) There are two pieces of chintz, the one is 9 cubits ſhorter than the other, and coſt 61 rupees, the other piece at the ſame price coſt 72 rupees: I demand how many yards were in both pieces, and the price of one yard? Anſr. one piece mea-

ſures 49$\frac{10}{11}$ cubits; the other 58$\frac{10}{11}$ cubits, each at 1 r. 3 a. 6$\frac{6}{9}$ p. per yard.

(28) A piece of ſattin coſt a certain ſum, and being ſold for 70 rupees, there is loſt $\frac{2}{5}$ in a rupee: I demand the firſt coſt? Anſr. 116 rs. 10 a. 8 p. $\frac{2}{3}$.

(29) With 13 gallons of Canary at 5 rupees a gallon, I mingled 20 gallons of white wine at 3 rs. 12 a. a gallon, and to theſe added 10 gallons of cyder at 2 rs. 4 a. per gallon, at what rate muſt I ſell a quarter of this mixture ſo as to clear 10 per cent? Anſr. 1 r. 0 a. 7 p. $\frac{92}{172}$ per quart.

(30) A perſon having built a bridge over a certain nullah, is determined that for every elephant that croſſes it, he will exact a toll of 8 pice, for every camel 4 pice, and every bullock 1 pice, all other cattle, &c. are to paſs free; now at the year's end the chokeedar pays the proprietor 236 rs. 15 a. 8p. and tells him, that for 5 elephants paſſed 9 camels, and for every 3 camels 10 bullocks. Required the number of each? Anſr. 2500 elephants, 4500 camels, and 7500 bullocks.

(31) Ninety-eight artificers received among them as their hire for a certain job 256 ſicca rupees, among whom were 20 riggers, 30 ſhipwrights, 24 blackſmiths, and 24 caulkers, which were divided thus, 4 riggers received as much as 5 ſhipwrights, 10 ſhipwrights as much as 16 blackſmiths, and 8 blackſmiths as much as 12 caulkers. Pray how much did each profeſſion receive? Anſr. 20 riggers received 80 rupees, 30 ſhipwrights 96 rupees, 24 blackſmiths 48 rupees; and 24 caulkers 32 rupees.

(32) A. and B. clear by an adventure to ſea 50 gold mohurs, their ſtocks were as 13 to 10, and they gained 45 per cent. I demand their reſpective ſtocks? Anſr. A.'s ſtock 1004.82 rupees, and B.'s 772.9 rupees.

(33) A. and B. in partnerſhip equally divide the gain; A.'s money which was 4000 rupees lay for 19 months, B.'s for no more than 7. the adventure of the latter is ſought. Anſr. 10857 rs. 2 a. 8 p. $\frac{2}{7}$.

(34) In a certain ſchool $\frac{1}{16}$ of the boys ſtudy Latin, $\frac{3}{8}$ ſtudy grammar, $\frac{3}{10}$ ſtudy accounts, and $\frac{3}{20}$ learn to write, and 9 to read; how many are there of each claſs, and what is the ſtrength of the ſchool? Anſr. 5 Latiniſts, 30 Grammarians, 24 Accomptants, 12 Writers, and 9 readers, in all 80 ſcholars.

(35) There are 7 cheſts of drawers, in each of which there are 18 drawers, and in each of theſe are 6 diviſions, in each of which are 3 gold mohurs, how many rupees are there in the whole? Anſr. 36288 rupees.

(36) A. and B. venturing equal ſums of money clear by joint trade 1540 rupees, by agreement A. was to have 8 per cent, becauſe he ſpent time in the execution of the profit, and B. was only to have 5. The queſtion is, what was allotted A. for his trouble? Anſr. 355 rs. 6 a. 1 p.

(37) A man dies and leaves a legacy of 9000 rupees to be diſpoſed of among his relations, viz. A. B. C. and D. which legacy is to be diſpoſed of in this order: B. is to have twice as much as A. and

C.

C. thrice as much as B. and D. is to have as much and $\frac{1}{2}$ as C. what muſt each perſon have? Anſr. A. 500, B. 1000, C. 3000, and D. 4500 rupees.

(38) Two merchants, A. and B. are in company, the ſum of their ſtocks is 3000 rupees, the money of A. continuing 9 months, the money of B. 11 months, they divide their gain equally. The queſtion is how much each man put in? Anſr. A.'s gain 1650, and B.'s 1350 rupees.

(39) The continual multiplication of the 9 digits will give the number of changes, that may be rung on 9 bells, as well as of any other combination; how many are there? Anſr. 362880 changes.

(40) Suppoſing that for a month's rent I paid in money 205 rs. 8 a. 4 p. and was allowed for a ſmall repair 107 rs. 9 a. 5 p. and for the taxes 36 rs. 14 a. 3 p. what did my tenant go at per month and year? Anſr. 350 rupees per month, and 4200 rupees per annum.

(41) There are two numbers, 75 is the leſs, to which the greater is in proportion as 8 to 5, what is the ſum and the product of their ſum and difference, and the difference and product of their ſquares, and the ſum of the ſquares of their 2 quotes the greater divided by the leſs and the leſs again by the greater? Anſr. 195 ſum, 87750 product of ſum and diff. 8775 diff. of ſq. 81000000 prod. of ſq. 2.950625 ſum of quotes.

(42) A piece of ground meaſures 368 ft. $7\frac{1}{2}$ in. by 9 ft. $4\frac{3}{4}$ in. required the contents in feet? Anſr. 3468 ft. 6 in. $5''\ 7'''\ 6''''$.

(43) A perſon was poſſeſſed of $\frac{3}{5}$ ſhare of a ſalt-work, and ſold $\frac{3}{4}$ of his intereſt therein for 17100 rupees, what was the value of the whole property at the ſame rate? Anſr. 38000 rupees.

(44) A. and B. join ſtocks, and purchaſe brandies. A.'s ſtock was 200 rupees more than that of B. now by ſelling out their commodity at 50 rupees per hogſhead A. cleared 100 rupees and B. 80 rupees; the quantity of brandy dealt for is required, and the gain upon the hogſhead? Anſr. 39.6 hogſheads, and 4.54 rupees gain per hhd.

(45) In an article of trade A. gains 145 rupees, and his adventure was 350 rupees more than B.'s whoſe ſhare of the profit is but 85 rupees, what are their reſpective ſtocks? Anſr. A.'s ſtock 845.83 rupees, and B.'s ſtock 495.83 rupees.

(46) In 147 times 568 pagodas how many current rupees, exchange at 345 Arcot rupees per 100 ſtar pagodas? Anſr. 3 lacks 11 thouſand 105.88 current rupees.

(47) Lent 1000 rupees at 10 per cent, which by the 18th November 1789 was raiſed to half as many again and 95 more; pray what day did the bond bear date? Anſr. 6th Dec. 83.

(48) An officer's pay and batta is 500 ſunaut rupees per month, how much is that per diem, and per annum in ſicca rupees? Anſr. 5741.376 ſ. rs. per annum, and 15.9482 ſ. rs. per diem.

(49) A. for a nine months adventure received 250 rupees, B. for one of 7 months received 23 gold mohurs and 7 rupees over, and C. for lying out

of his contribution 5 months had a title to 500 rupees. The total of their adventures multiplied into their reſpective times is 6500 rupees; what were their particular ſtocks? Anſr. A.'s ſtock 160.4938 rupees, B.'s ſtock 309.5238 rupees, and C.'s ſtock 577.7777 rupees.

(50) Bought 7 pipes of wine at 300 ct. rupees per pipe, which I ſell again at 350 ſicca rupees per pipe; what is the whole gain and how much per cent? Anſr. 639.66 ſ. rs. whole gain, and $35\frac{1}{7}$ per cent.

(51) Suppoſe I would exchange 100 gold mohurs for rupees, half rupees and quarter rupees, and would have $\frac{2}{14}$ in ſicca rupees, $\frac{5}{14}$ in half rupees, and $\frac{7}{14}$ in quarter rupees, how many pieces of each ſort ſhould I receive in exchange? Anſr. 228 rupees, 1142 halves, and 3200 quarters.

(52) Having a piece of ground 127 cottahs in front, let off to A. 57 cottahs to build on at one end, and to B. at firſt $35\frac{1}{2}$ cottahs, which he afterwards by conſent extended to 42 cottahs? what ground was left me in the centre? Anſr. 28 cottahs left.

(53) Suppoſe I would exchange 100 gold mohurs for rupees, half rupees and quarter rupees, and would have for every two rupees five half rupees, and for every 4 rupees 14 quarter rupees, how many pieces of each ſort ſhould I receive? Anſr. 512 rupees, 1280 halves, and 1792 quarters.

(54) If three dozen pairs of Coſſimbazar ſtockings be equal in value to 2 pieces of Madras izarees, 3 pieces of Madras izarees to 7 dozen cubits of Chi-

na graſs-cloth, 6 dozen cubits of China graſs-cloth to 2 pieces of coſſars, and 3 pieces of coſſars to 81 rupees, how many dozens of ſtockings may be bought for 28 rupees? Anſr. 2 dozens.

(55) A minor of 14 had an annuity left him of 1200 rupees, the proceeds of which, by will, was to be put out both principal and intereſt yearly, as it fell due, at 10 per cent, until he ſhould arrive at 21 years of age: the utmoſt improvement being thus made upon this part of his fortune, what had he then to receive? Anſr. 11384.6052 rupees.

(56) A merchant, through God's bleſſing and his own induſtry, in ten years time found himſelf worth 130000 rupees. From his books it appeared that the laſt 3 years he had cleared 8730 rupees per annum, the three preceding but 5860 rupees per annum, and the four before that but 3640 rupees per annum; I demand what ſum of money he ſet out with, and the ſtate of his fortune at the end of every year, during the time he continued in buſineſs? Anſr. 71670 rupees original ſtock.

(57) In order to raiſe a joint ſtock of 10000 rupees A. B. and C. together ſubſcribe 8500 rupees and D. the reſt; now B. and C. together ſubſcribed 6050 rupees, and C. told a perſon he had ſubſcribed 420 rupees more than B. pray what ſum did each of them ſet their hands to? Anſr. A. 2450 rupees, B. 2815 rupees, C. 3235 rupees, and D. 1500 rupees.

(58) A rice golah was robbed three nights ſucceſſively, the firſt night half the bags were ſtolen, and

half a bag more, the ſecond night half of the remainder was loſt, and half a bag more, the laſt night, they took half what were left, and half a bag more, by which time they were reduced to 20. How many were there at firſt? Anſr. 167 bags.

(59) A ſircar has been out with bills, and gives an account, that A. paid him 225 ſ. rs. B. 17 gold mohurs and 5 ſ. rs. 115 ſ. rs. 10 a. ſonaut, D. a bank note of 200 ſ. rs. E. 85 rupees, 12 half rupees, and 1 rupee in pice, F. a one hundred rupee note, 4 gold mohurs, and a half, and G. 400 arc. rs. how many rupees ſicca had he in his charge? Anſr. 1508 ſ. rs. 10 a. 3 p.

(60) I would put 60 hogſheads of porter into 30 wine pipes, and would know, what the caſk muſt hold that receives the difference .231, ſolid inches being the gallon of wine and 282 that of beer? Anſr. 143 gallons.

(61) Five hundred bars of iron, every ten of which weighed avoirdupoiſe weight, 4 cwt. 75 lbs. bought in London at 9 ſhils. and 6 pence, per cwt. is ſold in Calcutta at 73 ſ. rs. per bazar maund, required the bazar weight, amount ſale, whole profit, and profit per cent when in exchange the current rupee was valued at 2 ſhils. 3 pence. Anſr. 323.863 mds. 2428 .9725 amt. ſale, 1564.5089 whole, profit and 180 per cent.

(62) In how long time would a crore of crores of rupees be in counting ſuppoſing 100 rupees to be counted every minute without intermiſſion and the year to conſiſt of 365 days 6 hours? Anſr. 1901285 yrs. 9 ds. 1 hr. 58 min.

(63) In a ſeries of proportional numbers, the firſt is 5 the third 8 the product of the ſecond and third 78.4, what is the difference of the ſecond and fourth? Anſr. 5.88.

(64) What difference is there between the intereſt of 500 rupees at 5 per cent per annum, for 12 years, and the diſcount of the ſame ſum, at the ſame rate for the ſame time? Anſr. 112.5 rupees advantage on the ſide of intereſt.

(65) If $\frac{3}{7}$ of $\frac{4}{5}$ of $\frac{7}{8}$ of a ſhip be worth $\frac{1}{9}$ of $\frac{6}{7}$ of $\frac{11}{13}$ of her cargo valued at 1 lack and twenty thouſand rupees, what did my ſhare of ſhip and cargo ſtand me in, who am half owner? Anſr. 76117.216 rupees.

(66) A regiment of ſepoys, conſiſting of 976 men, are to be new cloathed, each coat to contain $2\frac{1}{2}$ yards of cloth, that is $\frac{5}{13}$ yards wide, and lined with ſhalloon each $\frac{7}{8}$ yards wide, how many yards of ſhalloon will line them? Anſr. $4531\frac{3}{7}$ yards.

(67) A wild young fellow in a ſhort time out-ran $\frac{1}{5}$ of his fortune, when his friends adviſed him to a plan, which drew from him 2200 rupees, he ſtill continued his extravagance till he had no more left than 924 rupees, which he found by computation was juſt $\frac{3}{20}$ of his property after he had laid out the above 2200 rupees: pray what was his fortune at firſt? Anſr. 10450 rupees.

(68) I want the length of a ſhoar, that being to ſtand 11 feet from the level of a ſhip's ſide will ſupport a jamb 23 feet 10 inches from the ground? Anſr. 26 ft. 2.988 inches.

(69)

(69) X. Y. Z. working together, can complete a job in 12 days, Z. alone can do it in 24 days, X. in 34 days, in what time can Y. get it done himſelf? Anſr. $81\frac{3}{5}$ days.

(70) In diſtreſs at ſea, they threw out 17 bales of cotton value 340 rupees per bale, the worth of which came up to be but $\frac{4}{7}$ of the indigo, they caſt over board, beſides which they threw out 13 iron guns worth 180 rs. 8 a. a piece, the value of all theſe amounted to $\frac{3}{7}$ of $\frac{9}{13}$ of the ſhip and lading, pray what of this value came into port? Anſr. $43239\frac{1}{9}$ rupees value came into port.

(71) A cooper having a 60 gallon caſk full of liquor with 3 cocks to it, one of which would empty it in 1 hour, another in twice the time, and the other in 3 hours, but for the ſake of diſpatch he ſets them all running together, in what time will it be empty? Anſr. $32\frac{8}{11}$ minutes.

(72) A boy being aſked how many ſcholars his maſter had replied, if there were as many, $\frac{1}{2}$ as many, and $\frac{1}{4}$ as many, there would be 154; how many had he? Anſr. 56 ſcholars.

(73) A. B. and C. join in company, and put in together 3822 rupees, A.'s money was in 3 months, B.'s money was in 5 months, and C.'s was in 7 months; they gained 234 rupees, which was ſo divided that $\frac{1}{2}$ of A.'s gain was equal to $\frac{1}{3}$ of B.'s and $\frac{1}{3}$ of B.'s to $\frac{1}{4}$ of C.'s, what did each gain and put in?

Anſr. A.'s gain	52 rs.—ſtock	468 rs.
B.'s -	78 - -	1170
C.'s -	104 - -	2184

(74) Divide 1000 gold mohurs; give A. 129 more than B. and B. 178 fewer than C. Anſr. 231 B.'s 360 A.'s, and 409 C.'s.

(75) A. with intention to clear 30 gold mohurs on a bargain with B. rates China dammer at 3 rupees the ſeer that ſtood him in 2 rs. 8 a. B. appriſed of that, ſet down malt which coſt him 5 rupees per maund at an adequate price: how much hortal did they contract for? Anſr. 480 maunds of hortal.

(76) A. in order to put off to B. 720 cubits of damaged muſlin worth 3 rs. 2 a. a cubit at 5 a. 4 p. propoſes in caſe he has ½ the value in money to give B. a diſcount of 10 per cent, the reſt A. is to take out in Chittagong canvas, which B. appriſed of the whole management, rates in juſtice at 9 rupees a bolt; pray what was it really worth in ready money, and what quantity of canvas was B. to deliver to A.? Anſr. 12 bolts at 6 rupees real value.

(77) A young jackall ſtarts 82.5 feet before a greyhound, and is not perceived by him till ſhe had been up 34 ſeconds; ſhe ſcuds away at the rate of 12 miles an hour, and the dog in view makes after her at the rate of 20; how long will the courſe hold, and what ground will be ran, beginning with the outſetting of the dog? Anſr. 1702.25 feet in 58.311875 ſeconds.

(78) A. leaves a place diſtant 130 coſs from Calcutta, at 10 o'clock in the morning for Calcutta, and goes at the rate of 2 coſs an hour without intermiſſion, B. ſets out of Calcutta for that place at 6 the ſame evening, and travels 3 coſs an hour conſtantly; the queſ-

tion is whereabouts on the road will they meet? Anſr. 68.4 coſs diſtance from Calcutta.

(79) A reſervoir for water has two cocks to ſupply it, by the firſt it may be filled in 44 minutes, by the ſecond in juſt an hour; and it hath a diſcharging cock, by which it may when full be emptied in half an hour; now ſuppoſe theſe 3 cocks by accident ſhould all of them be left open, and the water ſhould chance to come in, what time would this ciſtern be in filling? Anſr. $2\frac{3}{4}$ hours required.

(80) A. ſets out from Calcutta for a place at the very time that B. ſet out from that place to Calcutta diſtant 100 coſs; at 8 hours end they met on the road, and it then appeared that A. had ridden $2\frac{1}{2}$ coſs an hour more than B. at what rate an hour did each of them travel? Anſr. B. travelled 5 coſs, and A. 7 in 1 hour's time.

(81) A minor of 12 years of age was left an eſtate of 1500rs. per annum, his guardian was allowed by his father's will 500 rupees per annum for his board, education, and other contingent charges, and was to put out the ſurplus to intereſt for his benefit at 12 per cent ſimple intereſt, now ſuppoſing no loſs of principal or intereſt, what ſum had his guardian to pay him, when he was of age? Anſr. 13320 rupees.

(82) Five merchants, viz. A. B. C. D. and E. have gained 20250 rupees, which they divide in ſuch a manner that $\frac{1}{2}$ of the ſhare of A. is equal ſeverally of $\frac{1}{4}$ of the ſhare of B. $\frac{2}{5}$ of C. $\frac{1}{6}$ of D. and $\frac{1}{8}$ of E. The queſtion is how much did each man ſhare? Anſr. A. 1620, B. 3240, C. 4050, D. 4860, and E. 6480 rupees

(83) If 100 rupees being put forth for intereſt at a certain rate will at the end of 3 years be augmented to 115.7625 (compound intereſt or intereſt upon intereſt computed) what principal and intereſt will be due at the firſt year's end? Anſr. 105 rupees.

(84) An accomptant told a gentleman, who had conſtantly 8 perſons at his table, that he would gladly make a ninth, and was willing to give 210 rupees for his board ſo long as he could place the ſaid company at dinner differently from any one day before; this being accepted, what did his entertainment coſt him in a year? Anſr. 3 a. $4\frac{2}{10}$ p. per year.

(85) Three perſons enter into joint trade together, to which A. contributed 210 rupees, B. 312 rupees, they clear 140 rupees, whereof 37 rs. 8 a. belong of right to C. that perſon's ſtock, and the ſeveral gains of the other two are required? Anſr. 190.9756 rupees C.'s ſtock, 41.2357 A.'s gain, and 61.2643 B.'s gain.

(86) A. B. and C. will trench a field in 12 days, B. C. and D. in 14, C. D. and A. in 15, and D. A. and B. in 18; in what time will it be done by all of them together, and by each of them ſingly? Anſr. in 10.830 9505 days by all of them: in 47.848 days by A. in 38 .969 days by B. in 27.194 days by C. and 111.176 days by D.

(87) If during the tide of ebb a paunchway ſets out from Calcutta ſouthward, and at the ſame inſtant a boat leaves one of the Indiamen in Diamond Harbour for Calcutta, allowing the diſtance to be 34 coſs, the ſtream forwards, and retards the other $2\frac{1}{2}$ coſs per hour,

the boats are equally laden, the rowers equally good, and at the ordinary rate of rowing in ſlack water would proceed at the rate of 5 coſs per hour : where in the river would the two boats meet ? Anſr. 8$\frac{1}{2}$ miles from Calcutta, and 25$\frac{1}{2}$ from Diamond Harbour.

(88) A gay young fellow had 18200 rupees left him by an old uncle, to whoſe memory he expended 3 per cent of his whole fortune, in a ſumptuous funeral, and monument ; 9 per cent of the remainder he made a preſent to his couſins forgotten by the old man; with $\frac{2}{7}$ of the remainder he bought a houſe, and with $\frac{1}{8}$ of the reſidue a carriage and horſes, he ſquandered 550 rupees in gaming, and after having lived at the rate of 2000 rupees a year for 19 months, and ruined his health he died : what was there left for his ſiſter, who was heir at law ? Anſr. 6324rs. 0a. 9p.

(89) Three perſons purchaſed a ſnow, towards the payment whereof A. advanced $\frac{3}{8}$ B. $\frac{3}{7}$ and C. 1400 rupees, how much paid A. and B. and what part of the veſſel had C. ? Anſr. A. paid 2672.7272 rupees, B. paid 3054 .5454 rupees, and C. had $\frac{11}{56}$ part of the veſſel.

(90) A Nabob ſent his three wives a number of pearls, to be divided equally amongſt them, required how many were there, when a third ſixth and ninth made juſt 2200 pearls ? Anſr. 3600 pearls.

* * *

TABLE I.

Of Intereſt of any Sum of Money, of any Specie, from 1 Day to 10 Years, at 8 per Cent per Annum.

Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.
1	0002192	41	0089863	81	0177534	121	0265205
2	0004383	42	0092054	82	0179726	122	0267397
3	0006575	43	0094246	83	0181918	123	0269589
4	0008767	44	0096439	84	0184109	124	0271781
5	0010959	45	0098630	85	0186301	125	0273972
6	0013150	46	0100822	86	0188493	126	0276164
7	0015342	47	0103013	87	0190685	127	0278356
8	0017534	48	0105205	88	0192877	128	0280548
9	0019726	49	0107397	89	0195068	129	0282740
10	0021918	50	0109589	90	0197260	130	0284931
11	0024109	51	0111781	91	0199452	131	0287123
12	0026301	52	0113972	92	0201644	132	0289315
13	0028493	53	0116164	93	0203835	133	0291507
14	0030685	54	0118356	94	0206027	134	0293699
15	0032877	55	0120548	95	0208219	135	0295890
16	0035068	56	0122740	96	0210411	136	0298082
17	0037260	57	0124931	97	0212603	137	0300274
18	0039452	58	0127123	98	0214794	138	0302466
19	0041643	59	0129315	99	0216986	139	0304657
20	0043835	60	0131507	100	0219178	140	0306849
21	0046027	61	0133698	101	0221370	141	0309041
22	0048219	62	0135890	102	0223561	142	0311233
23	0050411	63	0138082	103	0225753	143	0313424
24	0052602	64	0140274	104	0227945	144	0315616
25	0054794	65	0142466	105	0230137	145	0317808
26	0056986	66	0144657	106	0232329	146	9319999
27	0059178	67	0146849	107	0234520	147	0312192
28	0061370	68	0149041	108	0236712	148	0324383
29	0063561	69	0151233	109	0238904	149	0326575
30	0065753	70	0153424	110	0241096	150	0328767
31	0067945	71	0155616	111	0243287	151	0330959
32	0070137	72	0157808	112	0245479	152	0333150
33	0072329	73	0159999	113	0247671	153	0335342
34	0074520	74	0162192	114	0249863	154	0337534
35	0076712	75	0164383	115	0252055	155	0339726
36	0078904	76	0166575	116	0254246	156	0341918
37	0081095	77	0168767	117	0256438	157	0344109
38	0083288	78	0170959	118	0258630	158	0346301
39	0085480	79	0173150	119	0260822	159	0348493
40	0087671	80	0175342	120	0263013	160	0350686

TABLE I.

Of Intereſt of any Sum of Money, of any Specie, from 1 Day to 10 Years, at 8 per Cent per Annum.

Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.
101	0352877	201	0440548	241	0528219	281	0615890
162	0355068	202	0442740	242	0530410	282	0618082
163	0357260	203	0444931	243	0532602	283	0620274
164	0359452	204	0447123	244	0534794	284	0622466
165	0361644	205	0449315	245	0536986	285	0624657
166	0363835	206	0451507	246	0539178	286	0626849
167	0366027	207	0453699	247	0541370	287	0629041
168	0368219	208	0455890	248	0543561	288	0631233
169	0370411	209	0458082	249	0545753	289	0633424
170	0372603	210	0460274	250	0547945	290	0635616
171	0374794	211	0462466	251	0550136	291	0637808
172	0376986	212	0464657	252	0552328	292	0640000
173	0379178	213	0466850	253	0554520	293	0642192
174	0381370	214	0469041	254	0556711	294	0644383
175	0383561	215	0471233	255	0558904	295	0646575
176	0385753	216	0473424	256	0561095	296	0648767
177	0387945	217	0475616	257	0563287	297	0650959
178	0390137	218	0477808	258	0565479	298	0653150
179	0392329	219	0479999	259	0567671	299	0655342
180	0394520	220	0482192	260	0569863	300	0657534
181	0396712	221	0484383	261	0572054	301	0659726
182	0398904	222	0486575	262	0574246	302	0661918
183	0401095	223	0488767	263	0576438	303	0664109
184	0403287	224	0490959	264	0578630	304	0666301
185	0405479	225	0493150	265	0580821	305	0668492
186	0407671	226	0495342	266	0583013	306	0670685
187	0409863	227	0497534	267	0585205	307	0672877
188	0412055	228	0499720	268	0587397	308	0675068
189	0414244	229	0501918	269	0589589	309	0677260
190	0416438	230	0504109	270	0591780	310	0679452
191	0418630	231	0506301	271	0593972	311	0681644
192	0420822	232	0508493	272	0596164	312	0283830
193	0423013	233	0510685	273	0598356	313	0686027
194	0425205	234	0512877	274	0600547	314	0588219
195	0427397	235	0515068	275	0602739	315	0690411
196	0429589	236	0517260	276	0604931	316	0692603
197	0431781	237	0519452	277	0607123	317	0694794
198	0433972	238	0521644	278	0609315	318	0696986
199	0436164	239	0523833	279	0611506	319	0699178
200	0438356	240	0526027	280	0613698	320	0701370

TABLE I.

Of Intereſt of any Sum of Money, of any Specie, from 1 Day to 10 Years, at 8 per Cent per Annum.

Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.	Mo.	Decimal Parts.
321	0703561	341	0747397	361	0791233	10	066
322	0705753	342	0749589	362	0793424	11	073
323	0707945	343	0751781	363	0795616	12	080
324	0710137	344	0753972	364	0797808		
325	0712329	345	0756164	365	0800000		
326	0714520	346	0758356			Years.	
327	0716712	347	0760548				
328	0718904	348	0762740	Months.			
329	0721096	349	0764931			1	08
330	0723287	350	0767123			2	16
331	0725479	351	0769315			3	24
332	0727671	352	0771507	1	006	4	32
333	0729863	353	0773698	2	013	5	40
334	0732055	354	0775890	3	020	6	48
335	0734246	355	0778082	4	026	7	56
336	0736438	356	0780274	5	033	8	64
337	0738630	357	0782466	6	040	9	72
338	0740822	358	0784657	7	046	10	80
339	0743014	359	0786849	8	053		
340	0745205	360	0789041	9	060		

TABLE II.

TABLE II.

Of Intereſt of any Sum of Money, of any Specie, from 1 Day to 10 Years, at 10 per Cent per Annum.

Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.
1	0002740	41	0112329	81	0221918	121	0331507
2	0005479	42	0115068	82	0224657	122	0334246
3	0008219	43	0117808	83	0227397	123	0336986
4	0010959	44	0120548	84	0230137	124	0339726
5	0013698	45	0123287	85	0232876	125	0342466
6	0016438	46	0126027	86	0235616	126	0345205
7	0019178	47	0128767	87	0238356	127	0347945
8	0021918	48	0131507	88	0241096	128	0350685
9	0024657	49	0134246	89	0243835	129	0353424
10	0027397	50	0136986	90	0246575	130	0356164
11	0030137	51	0139726	91	0249315	131	0358904
12	0032877	52	0142466	92	0252055	132	0361644
13	0035616	53	0145205	93	0254794	133	0364383
14	0038356	54	0147943	94	0257534	134	0367123
15	0041096	55	0150685	95	0260274	135	0369863
16	0043835	56	0153424	96	0263013	136	0372603
17	0046575	57	0156164	97	0265753	137	0375342
18	0049315	58	0158904	98	0268493	138	0378082
19	0052055	59	0161644	99	0271232	139	0380822
20	0054794	60	0164383	100	0273972	140	0383561
21	0057534	61	0167123	101	0276712	141	0386301
22	0060274	62	0169863	102	0279452	142	0389041
23	0063013	63	0172603	103	0282192	143	0391781
24	0065753	64	0175342	104	0284931	144	0394520
25	0068493	65	0178082	105	0287671	145	0397260
26	0071233	66	0180822	106	0290411	146	0399999
27	0073972	67	0183561	107	0293150	147	0402749
28	0076712	68	0186301	108	0295890	148	0405479
29	0079452	69	0189041	109	0298630	149	0408219
30	0082192	70	0191781	110	0301370	150	0410959
31	0084931	71	0194520	111	0304109	151	0413698
32	0087671	72	0197260	112	0306849	152	0416438
33	0090411	73	0199999	113	0309589	153	0419178
34	0093150	74	0202740	114	0312329	154	0421918
35	0095890	75	0205480	115	0315068	155	0424657
36	0098630	76	0208220	116	0317808	156	0427397
37	0101370	77	0210959	117	0320548	157	0430137
38	0104110	78	0213699	118	0323287	158	0432876
39	0106850	79	0216430	119	0326027	159	0435616
40	0109590	80	0219178	120	0328767	160	0438356

TABLE II.

Of Intereſt of any Sum of Money, of any Specie, from 1 Day to 10 Years, at 10 per Cent per Annum.

Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.
161	0441096	201	0550685	241	0660274	281	0769863
162	0443835	202	0553424	242	0663013	282	0772603
163	0446575	203	0556164	243	0665753	283	0775342
164	0449315	204	0558904	244	0668493	284	0778082
165	0452055	205	0561644	245	0671233	285	0780822
166	0454794	206	0564383	246	0673972	286	0783561
167	0457534	207	0567123	247	0676711	287	0786301
168	0460274	208	0569861	248	0679451	288	0789041
169	0463013	209	0572603	249	0682195	289	0791781
170	0465753	210	0575342	250	0684931	290	0794520
171	0468493	211	0578082	251	0687671	291	0797260
172	0471233	212	0580822	252	0690411	292	0799999
173	0473972	213	0583561	253	0693150	293	0802740
174	0476712	214	0586301	254	0695890	294	0805479
175	0479452	215	0589041	255	0698630	295	0808219
176	0482191	216	0591781	256	0701370	296	0810950
177	0484931	217	0594520	257	0704109	297	0813698
178	0487671	218	0597260	258	0706849	298	0816438
179	0490410	219	0599999	259	0709589	299	0819178
180	0493150	220	0602740	260	0712329	300	0821918
181	0495890	221	0605479	261	0715068	301	0824657
182	0498630	222	0608219	262	0717808	302	0827397
183	0501370	223	0610959	263	0720548	303	0830137
184	0504109	224	0613698	264	0723287	304	8832878
185	0506849	225	0616438	265	0726027	305	0835616
186	0509589	226	0619178	266	0728767	306	0838356
187	0512329	227	0621918	267	0731507	307	0841096
188	0515068	228	0624647	268	0734246	308	0843835
189	0517808	229	0627387	269	0736986	309	0846575
190	0520548	230	0630137	270	0739726	310	0849315
191	0523287	231	0632877	271	0742466	311	0852055
192	0526027	232	0635616	272	0745205	312	0854794
193	0528767	233	0638356	273	0747945	313	0857534
194	0531507	234	0641096	274	0750685	314	0860274
195	0534246	235	0643835	275	0753424	315	0863013
196	0536986	236	0646575	276	0756164	316	0865753
197	0539726	237	0649315	277	0758904	317	0868493
198	0542466	238	0652055	278	0761644	318	0871233
199	0545205	239	0654794	279	1764383	319	0873972
200	0547945	240	0657534	280	0767123	320	0876712

TABLE II.

Of Intereſt of any Sum of Money, of any Specie, from 1 Day to 10 Years, at 10 per Cent per Annum.

Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.	Mo.	Decimal Parts.
321	0879452	341	0934246	361	0989041	10	08333
322	0882192	342	0936986	362	0991780	11	09166
323	0884931	343	0939726	363	0994520	12	10000
324	0887671	344	0942466	364	0997260		
325	0890411	345	0945205	365	1000000		
326	0893150	346	0947945				
327	0895890	347	0950685			Years.	
328	0898630	348	0953424	Months.			
329	0901370	349	0956164				
330	0904109	350	0958904				
331	0906849	351	0961644			1	1
332	0909589	352	0964383	1	00833	2	2
333	0912329	353	0967123	2	01666	3	3
334	0915068	354	0969863	3	02500	4	4
335	0917808	355	0972603	4	03333	5	5
336	0920548	356	0975342	5	04166	6	6
337	0923287	357	0978082	6	05000	7	7
338	0926027	358	0980822	7	05833	8	8
339	0928767	359	0983561	8	06666	9	9
340	0931507	360	0986301	9	07500	10	10

TABLE III.

Of Intereſt of any Sum of Money, of any Specie, from 1 Day to 10 Years, at 12 per Cent per Annum.

Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.
1	0003287	41	0134794	81	0266301	121	0397808
2	0006575	42	0138082	82	0269589	122	0401096
3	0009863	43	0141370	83	0272877	123	0404383
4	0013150	44	0144657	84	0276164	124	0407671
5	0016438	45	0147945	85	0279452	125	0410959
6	0019726	46	0151233	86	0282740	126	0414246
7	0023013	47	0154520	87	0286027	127	0417534
8	0026301	48	0157808	88	0289315	128	0420822
9	0029589	49	0161096	89	0292603	129	0424109
10	0032877	50	0164383	90	0295890	130	0427397
11	0036164	51	0167671	91	0299178	131	0430685
12	0039452	52	0170959	92	0302466	132	0433972
13	0042740	53	0174246	93	0305753	133	0437260
14	0046027	54	0177534	94	0309041	134	0440549
15	0049315	55	0180822	95	0312329	135	0443835
16	0052603	56	0184109	96	0315616	136	0447123
17	0055890	57	0187397	97	0318904	137	0450411
18	0059178	58	0190685	98	0322192	138	0453698
19	0062466	59	0193972	99	0325479	139	0456986
20	0065753	60	0197260	100	0328767	140	0460274
21	0069041	61	0200548	101	0332055	141	0463561
22	0072329	62	0203835	102	0335342	142	0466849
23	0075616	63	0207123	103	0338630	143	0470137
24	0078904	64	0210410	104	0341918	144	0473424
25	0082192	65	0213698	105	0345205	145	0476712
26	0085479	66	0216986	106	0348493	146	0479999
27	0088767	67	0220274	107	0351781	147	0483287
28	0092055	68	0223561	108	0355068	148	0486575
29	0095342	69	0226849	109	0358356	149	0489863
30	0198630	70	0230137	110	0361644	150	0493150
31	0101918	71	0233424	111	0364931	151	0496438
32	0105205	72	0236712	112	0368219	152	0499726
33	0108493	73	0239999	113	0371507	153	0503013
34	0111781	74	0243287	114	0374794	154	0506301
35	0115068	75	0246575	115	0378082	155	0509589
36	0118356	76	0249863	116	0381370	156	0512877
37	0121644	77	0253150	117	0384657	157	0516164
38	0124931	78	0256438	118	0387945	158	0519452
39	0128219	79	0259726	119	0391233	159	0522740
40	0131507	80	0263013	120	0394520	160	0526027

TABLE III.

Of Intereſt of any Sum of Money, of any Specie, from 1 Day to 10 Years, at 12 per Cent per Annum.

Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.
161	0529315	201	0660822	241	0792328	201	0923845
162	0532603	202	0664109	242	0795616	288	0927123
163	0535890	203	0667397	243	0798904	283	0930411
164	0539178	204	0670685	244	0802192	284	0933698
165	0542466	205	0673972	245	0805479	285	0936986
166	0545754	206	0677260	246	0808767	286	0940274
167	0549041	207	0680548	247	0812055	287	0943561
168	0552329	208	0683835	248	0815342	288	0946849
169	0555616	209	0687123	249	0818630	289	0950137
170	0558904	210	0690411	250	0821918	290	0953424
171	0562192	211	0693698	251	0825205	291	0956712
172	0565479	212	0696986	252	0828493	292	0959999
173	0568767	213	0700274	253	0831781	293	0963287
174	0572054	214	0703561	254	0835068	294	0966575
175	0575342	215	0706849	255	6838356	295	0969863
176	0578630	216	0710137	256	0841644	296	0973150
177	0581918	217	0713424	257	0844931	297	0976438
178	0585205	218	0716712	258	0848219	298	0979726
179	0588493	219	0719999	259	0851507	299	0983013
180	0591781	220	0723287	260	0854794	300	0986301
181	0595068	221	0726575	261	0858082	301	0989589
182	0598356	222	0729863	262	0861370	302	0992877
183	0601644	223	0733150	263	0864657	303	0996164
184	0604931	224	0736438	264	0867945	304	0999452
185	0608219	225	0739726	265	0871233	305	1002740
186	0611507	226	0743013	266	0874520	306	1006027
187	0614794	227	0746301	267	0877808	307	1009315
188	0618082	228	0749589	268	0881096	308	1012603
189	0621370	229	0752877	269	0884383	309	1015890
190	0624657	230	0756164	270	0887671	310	1019178
191	0627945	231	0759452	271	0890959	311	1022465
192	0631233	232	0762740	272	0894246	312	1025753
193	0634520	233	0766027	273	0897534	313	1029041
194	0637808	234	0769315	274	0900822	314	1032329
195	0641096	235	0772603	275	0904109	315	1035616
196	0644383	236	0775890	276	0907397	316	1038904
197	0647671	237	0779178	277	0910685	317	1042192
198	065 959	238	0782466	278	0913972	318	1045479
199	0654246	239	0785753	279	0917260	319	1048767
200	0657534	240	0789041	280	0920548	320	1052055

TABLE III.

Of Intereſt of any Sum of Money, of any Specie from 1 Day to 10 Years, at 12 per Cent per Annum.

Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.	Days.	Decimal Parts.
322	1055342	341	1121096	361	1186849	10	10
323	1058630	342	1124383	362	1190137	11	11
323	1061918	343	1127671	363	1193424	12	12
324	1065205	344	1130959	364	1196712		
325	1068493	345	1134246	365	1200000		
326	1071781	346	1137534				
327	1075068	347	1140822				
328	1078356	348	1144109			Years.	
329	1081644	349	1147397	Months.			
330	1084931	350	1150685				
331	1088219	351	1153972			1	12
332	1091507	352	1157260	1	01	2	24
333	1094794	353	1160548	2	02	3	36
334	1098082	354	1163835	3	03	4	48
335	1101370	355	1167123	4	04	5	60
336	1104657	356	1170411	5	05	6	72
337	1107945	357	1173698	6	06	7	84
338	1111233	358	1176986	7	07	8	96
339	1114520	359	1180274	8	08	9	108
340	1117808	360	1183561	9	09	10	120

EXPLANATION of the uſe of the three preceding Tables of Intereſt, at 8, 10, and 12 per cent for any time to come, which are found by the following proportion 365×100 : are to the rate per cent : : 1×1 : are to the Decimals for one day, from which the other numbers are made by continual addition.

Firſt. If the ſum given have annas and pice, they muſt be reduced to decimals of a rupee by table the ninth.

Secondly. Multiply the ſum given to the decimal parts oppoſite the time, for which the Intereſt is required, the product, when the decimal places are cut off, produces the Anſwer.

Thirdly. Seek in the table of decimal parts for the value of the decimal.

(1) Required the Intereſt of 1000 rupees for 225 days at 8 per cent?

Oppoſite 225 are the figures - - .0493150
which I multiply by the ſum given - - 1000

and cut off the 7 places of decimals 49.3150000
The value of the decimal, according to Table IX. is 5 annas. The intereſt of 1000 rupees for 225 days at 8 per cent is therefore 49 rs. 5 a.

(2) Required the intereſt of 2750 rs. 12 a. for 1 year and 3 months at 10 per cent?

Oppoſite 1 year .1
Oppoſite 3 months .025

Their ſum - - .125

Principal,

Principal - - -	2750.75
	125
	1375375
	3300900
Intereſt - -	343.84375=13.6

(3) Required the intereſt of 1250 rs. 5 a. 4 p. for 2 yrs. 3 mo. 15 ds. or 2 yrs. 106 ds. at 12 per cent.

Oppoſite 2 years are	.24
Oppoſite 106 days are	.034849
Their ſum - - -	.274849
Principal - - -	1250.33
	824547
	824547
	13742450
	3298188
Intereſt - -	343.65195017=10 a. 5 p.

TABLE IV.

Of converging Series, or extracting the Roots of all Powers.

A TABLE OF POWERS.

Roots, - - or 1ſt Powers,	1	2	3	4	5	6	7	8	9
Squares, - - or 2d Powers,	1	4	9	16	25	36	49	64	81
Cubes, - - or 3d Powers,	1	8	27	64	125	216	343	512	729
Biquadrates, - or 4th Powers,	1	16	81	256	625	1296	2401	4096	6561
Surſolids, - - or 5th Powers.	1	32	243	1024	3125	7776	16807	32768	59049
Square Cubes, - - or 6th Powers,	1	64	729	4096	15625	46656	117649	262144	531441
Second Surſolids, or 7th Powers,	1	128	2187	16384	78125	279936	823543	2097152	4782969
Biquadrates ſqu. or 8th Powers,	1	256	6561	65536	390625	1679616	5764801	16777216	43046721
Cubes cubed, - or 9th Powers,	1	512	19683	262144	1953125	10077696	40353607	134217728	387420489
Surſolids ſquared, or 10th Powers,	1	1024	59049	1048576	9765625	60466176	282475249	1073741824	3486784401
Third Surſolids, or 11th Powers,	1	2048	177147	4194304	48828125	362797056	1977326743	8589934592	31381059609
Square Cubes ſqu. or 12th Powers,	1	4096	531441	16777216	244140625	2176782336	13841287201	68719476736	282429536481
Fourth Surſolids, or 13th Powers,	1	8192	1594323	67108864	1220703125	13060694016	96889010407	549755813888	2541865828329
Sec. Surſolids ſqu. or 14th Powers,	1	16384	4782969	268435456	6103515625	78364164096	678223072849	4398046511104	22876792454961
Surſolids cubed, or 15th Powers,	1	32768	14348907	1073741824	31517578125	470184984576	4747561509943	35184372088832	205891132094649

TABLE V.

A Table for reducing Rupees of 8, 11, and 16 per Cent better than Current to Current Rupees, and *vice verſa*; alſo for reducing Sicca Rupees into Arcot and Sonaut, and *vice verſa*.

INDEX.	Sicca Rupees to Current at 16 per Cent	Arcot Rupees to Current at 8 per Cent.	Sonaut Rupees to Current at 11 per Cent.	Current Rupees to Sicca Rupees at 16 per Cent.	Current Rupees to Arcot Rupees at 8 per Cent.
1	1160000	1080000	1110000	0862069	0925926
2	2320000	2160000	2220000	1724138	1851852
3	3480000	3240000	3330000	2586207	2777778
4	4640000	4320000	4440000	3448276	3703704
5	5800000	5400000	5550000	4310345	4629629
6	6960000	6480000	6660000	5172414	5555555
7	8120000	7560000	7770000	6034483	6481481
8	9280000	8640000	8880000	6896552	7407407
9	1014000	9720000	9990000	7758621	8333333

INDEX.	Current Rupees to Sonaut at 11 per Cent.	Sicca Rupees to Arcot, or 16 per Ct. to 8 per Ct.	Sicca Rupees to Sonaut, or 16 per Ct. to 11 per Ct.	Arcot Rupees to Sicca, or 8 per Ct. to 16 per Ct.	Sonaut Rupees to Sicca, or 11 per Ct. to 16 per Ct.
1	0900900	1074074	1045045	0931034	0956896
2	1801802	2148148	2090090	1862069	1913793
3	2702703	3222222	3135135	2793103	2870699
4	3603604	4296296	4180180	3724139	3827586
5	4504504	5370370	5225225	4655172	4784483
6	5405405	6444444	6270270	5586207	5741379
7	6306306	7518518	7315315	6517241	6698276
8	7207207	8592592	8360360	7448276	7655172
9	8108108	9666666	9405405	8379310	8612069

EXPLANATION of the foregoing Table, which is found thus:

100+16=116
100+8=108
100+11=111
116)100(0862069
108)100(0925926

111)100(0900900
100)116(1074074
111)116(1045045
116)108(0931034
116)111(0956896

The other numbers are made by addition.

Suppoſe it was required to reduce 5746 ſicca rupees to ſonaut rupees,

Under the column of ſicca ſpecie reduced to ſonaut,

And oppoſite 5 in the index, are 5225.225
Ditto - 7 - - - 731.531
Ditto - 4 - - - 41.801
Ditto - 6 - - - 6.270

Anſr. S. Rs. 6004.827=13a.2p.

Cut off as many places to the left for integers, as the number ſought for contains, and place the integers and decimals regularly under each other, as above.

Reduce 735 ſ. rs. 11 a. 6 p. to Arcot rupees.

7 - 751.8518
3 - 32.2222
5 - 5.3703
.7 - .7518
.1 - 107
.8 - 85

Anſr. A. Rs. 790.2153=3a. 5p.

Reduce 849 ct. rs. 12 a. 4 p. to ſicca rupees.

8 - 689·6552
4 - 34·4827
9 - 7·7586
·7 - ·6034
·5 - 431

Anſr. S. Rs. 732·5430=8a. 8p.

Reduce 2500 ſnt. rs. 8 a. to ſicca rupees.

2 - 1913·793
5 - 478·448
5 - ·478

Anſr. S. Rs. 2392·719=11 6

Reduce 70,000 current rupees to Arcot.
Anſr. A. Rs. 64814.81=13

TABLE VI.

A Table for reducing Sicca Rupees (from 1 s. 11 d. the Current Rupee to 2 s. 3 d.) to Pounds Sterling, and *vice verſa.*

INDEX.	S. Rs. at 1 s. 11 d. per Ct. R. reduced to Pounds Sterling.	S. Rs. as 2 s. per Ct. R. reduced to Pounds Sterling.	S. Rs. at 2 s. 1 d. per Ct. R. reduced to Pounds Sterling.	S. Rs. at 2 s. 2 d. per Ct R. reduced to Pounds Sterling.	S. Rs. at 2 s. 3 d. per Ct. R. reduced to Pounds Sterling.
1	0111166	0116000	0120833	0125666	0130500
2	0222333	0232000	0241666	0251333	0261000
3	0333500	0348000	0362500	0377000	0391500
4	0444666	0464000	0483333	0501666	0522000
5	0555833	0580000	0604166	0628333	0652500
6	0667000	0696000	0625000	0754000	0783000
7	0778166	0812000	0845833	0879666	0913500
8	0889333	0928000	0966666	1005333	1044000
9	1000500	1044000	1087500	1131000	1174500

INDEX.	Pounds Sterling reduced to S. Rs. at 1 s. 11 d. per Ct. R.	Pounds Sterling reduced to S. Rs. at 2 s. per Ct. R.	Pounds Sterling reduced to S. Rs. at 2 s. 1 d. per Ct. R.	Pounds Sterling reduced to S. Rs. at 2 s. 2 d. per Ct. R.	Pounds Sterling reduced to S. Rs. at 2 s. 3 d. per Ct. R.
1	899550	862069	827586	795756	766283
2	1599100	1724138	1655172	1591512	1532567
3	2698650	2586207	2482758	2387268	2298850
4	3698200	3448276	3310345	3183024	3065134
5	4497750	4310345	4137931	3978780	3831417
6	5397300	5172414	4965517	4774536	4597701
7	6296850	6034483	5793103	5570292	5363984
8	7196400	6896552	6620689	6366048	6130268
9	8095950	7758621	7448276	7161804	5896552

EXPLANATION of the foregoing Table, the firſt line of figures of which in each column of Rupees reduced to Crurency are found thus.

$$\begin{array}{c}\text{f. rs.}\quad\text{c. rs.}\\ 100 : 116\text{ each}\end{array}\overset{\text{d.}}{\left\{\begin{array}{c}23\\24\\25\\26\\27\end{array}\right\}}\begin{array}{c}\text{f. rs.}\\ : : 1 :\end{array}\overset{\text{d.}}{\left\{\begin{array}{c}26.68\\27.84\\29.00\\30.16\\31.32\end{array}\right\}}\text{or}\overset{\text{l ſtg.}}{\left\{\begin{array}{c}.111166\\.116000\\.120833\\.125666\\.1305\end{array}\right\}}$$

And the firſt line of figures in each column of pounds ſterling reduced to current rupees are found thus.

$$\begin{array}{c}\text{ct. rs.}\\ 116\text{ ea.}\end{array}\overset{\text{d.}}{\left\{\begin{array}{c}23\\24\\25\\26\\27\end{array}\right\}}\begin{array}{c}\text{f. rs. l. ſtg.}\\ : 100 : : 1\end{array}\left\{\begin{array}{l}.899550\\.862069\\.827586\\.795756\\.766283\end{array}\right.$$

The other numbers are ſound by the continual addition of the firſt number.

To work queſtions by the Tables.

The Index ſhews the given ſum, oppoſite which is its value in the denomination you wiſh to reduce them to, cutting off as many places of decimals on the left hand, as the given ſum conſiſts of integers.

Thus, If 5748 f. rs. exchange at 1 s. 11 d. per current rupee are given to be reduced to pounds ſterling,

I find oppoſite to 5 - 0555.833
7 - 077.816
4 - 04.446
8 - 0.889

Anſr. l. ſt. 638.984 = 19s. 8.64d.

Or if 765 l. ſterling are required to be reduced to ſicca rupees, when the current rupee in exchange is reckoned at 25 d. oppoſite 7 - 5793.103

6 - 496.551

5 - 41.379

S. Rs. 6331.033

Again reduce 5948 ſ. rs. 7 a. 8 p. exchange at 2 s. per current rupee to pounds ſterling.

5 - 580

9 - 104.4

4 - 4.64

8 - 0.928

4 - 046

7 - 08

9 - 1

£ ſterl. 690.023

In £500 12 s. 6 d. how many ſicca rupees, when the current rupee in exchange is reckoned at 2 s. 2 d. each?

5 - 3978.78

6 - 4.774

2 - .159

5 - 39

Anſr. S. Rs. 3983.752

In £10000 how many ſicca rupees, valuing the current rupee at 2 s. 3 d.? Anſr. 76628.33 ſicca rupees.

TABLE VII.

A Table for reducing Current Rupees from 1 s. 11 d. to 2 s. 3 d. each to Pounds Sterling, and *vice verſa.*

INDEX.	C. Rs. at 1 s. 11 d. reduced to Pounds Sterling.	C. Rs. at 2s. reduced to Pounds Sterling.	C. Rs. at 2 s. 1 d. reduced to Pounds Sterling.	C. Rs. at 2 s. 2d. reduced to Pounds Sterling.	C. Rs. at 2 s. 3 d. reduced to Pounds Sterling.
1	0095833	0100000	0104166	0108333	0112500
2	0191666	0200000	0208333	0216666	0225000
3	0287500	0300000	0312500	0325000	0337500
4	0383333	0400000	0416666	0433333	0450000
5	0479166	0500000	0520833	0541666	0562500
6	0575000	0600000	0625000	0650000	0675000
7	0670833	0700000	0729166	0758333	0787500
8	0766666	0800000	0833333	0866666	0900000
9	0862500	0900000	0937500	0975000	1012500

INDEX.	Pounds Sterling reduced to C. Rs. at 1 s. 11 d.	Pounds Sterling reduced to C. Rs. at 2s.	Pounds Sterling reduced to C. Rs. at 2 s. 1 d.	Pounds Sterling reduced to C. Rs. at 2s. 2 d.	Pounds Sterling reduced to C. Rs. at 2 s. 3 d.
1	1043478	1000000	960000	923077	888888
2	2086956	2000000	1920000	1846154	1777777
3	3130435	3000000	2880000	2769231	2666666
4	4173913	4000000	3840000	3692308	3555555
5	5217391	5000000	4800000	4615385	4444444
6	6260869	6000000	5760000	5538461	5333333
7	7304348	7000000	6720000	6461538	6222222
8	8347826	8000000	7680000	7384615	7111111
9	9391304	9000000	8640000	8307692	8000000

EXPLANATION of the foregoing Table,—the firſt line of figures of which in each column of rupees reduced to currency are found by taking the decimal parts of the value of one rupee,

Thus, 23 d.	÷ by 12 and 20 =	.095833
24		.010000
25		.010416
26		.010833
27		.011250

And the firſt line of figures in each column of pounds reduced to current rupees, are found by the following proportions:

23 d.	C. R. 1 : : L. Ster. 1	1043478
24		1
25		96
26		923077
27		888888

The other numbers are found by Addition.

To work Queſtions in the Tables,

Uſe the ſame rule as given in the Explanation of Table V.

Reduce 5000 current rupees, each 1s. 11d. to l. ſterl. Anſr. 479.166 l. ſterl.

How many current rupees each 2s. are in 4518 l.?

4 - 40000
5 - 5000
1 - 100
8 - 80

Anſr. C. Rs. 45180

How many pounds are in 6425 c. rs. 12 a. each 2 s. 1 d.?

6 - 0625.000
4 - 041.666
2 - 02.083
5 - 0.520
·7 - .072
·5 - 05

Anſr. L. ſterl. 669.346=6s. 11d.

How many current rupees each 2 s. 2 d. are in 27560l. 7 s. 6 d.?

2 - 184615.4
7 - 64615.39
5 - 4615.385
6 - 553.846
·3 - 2.769
·7 - .646
·5 - 46

Anſr. C. Rs. 254403.482=7a. 8p.

How many l. ſterl. are in 50600 current rupees each 2 s. 3 d.?

5 - 05625.00
6 - 067.50

L. ſterl. 5692.50=10s. Anſr.

TABLE VIII.

TABLE VIII.

A Table for reducing Weights of one Denomination, into Weights of another Denomination, retaining the ſame value.

INDEX.	To reduce Bazar Maunds into Factory Maunds. 11/10	To reduce Factory Maunds into Bazar Maunds. 10/11	To reduce Bazar Maunds into Avordupois wt. 11/15	To reduce Factory Maunds to Avoirdupois weight. 2/3	To reduce Avoirdupois weight to Bazar Maunds. 15/11
1	1100000	0909090	0733333	666666	136363
2	2200000	1818181	1466666	1333333	272727
3	3300000	2727272	2200000	2000000	409091
4	4400000	3636363	2933333	2666666	545454
5	5500000	4545454	3666666	3333333	681818
6	6600000	5454545	4400000	4000000	818182
7	7700000	6363636	5133333	4666666	954545
8	8800000	7272727	5866666	5333333	1090909
9	9900000	8181818	6600000	6000000	1127273

INDEX.	To reduce Avoirdupois Wt. to Factory Mds. 3/2	To reduce Bazar Mds. to Madras Mds. 1232/375	To reduce Factory Mds. to Madras Mds. 224/75	To reduce Madras Mds. to Bazar Mds. 375/1232	To reduce Madras Mds. to Factory Mds. 75/224
1	150000	328533	298666	0304384	0334821
2	300000	657066	597333	0608769	0669649
3	450000	985600	896000	0913153	1004473
4	600000	1314133	1194666	1217537	1339298
5	750000	1642666	1493333	1521922	1674122
6	900000	1971200	1792000	1826306	2008946
7	1050000	2299733	2090666	2130690	2343771
8	1200000	2628266	2389333	2435075	2678595
9	1350000	2956800	2688000	2730459	3013420

EXPLANATION OF TABLE VIII.

THE firſt lines in each column of which are wrought for agreeable to the rules and proportions laid down in Compariſon of Weights and Meaſures, and are quotients to the fractions on the top of each column, the upper number being the dividend and the lower the diviſor. To ſolve queſtions by the table, obſerve the ſame rules as given to Tables 5th, 6th, and 7th.

(1) In 700 bazar maunds how many factory maunds? Oppoſite 7 are 770.000, from which cut off three figures to the left for hundreds, and you have the anſwer in factory maunds.

(2) In 500 factory maunds how many bazar maunds? Anſr. f. mds. 454.5454=21 ſrs. 13 chs.

(3) In 895 bazar maunds how many cwt.?

8 - 586.6666
9 - 66.0000
5 - 3.6666

Anſr. Cwt. 656.3332=1 qr. 9 lb. 6 oz.

(4) 700 f. mds. 20 ſrs. how many cwt.?

7 - 466.6666
5 - .3333

Anſr. Cwts. 466.999=467 cwt.

(5) In 19 t. 14 cwt. 2 qrs. 5 lb. avoirdupois weight how many bazar maunds?

```
 19        3  -  409.091
 20        9  -  122.727
———        4  -    5.454
394       .5  -     681
═══       .4  -      54
          .4  -       5
              ─────────
```

Anſr. B. Mds. 538.012=1 ch.

(6) Reduce 756 3 to factory maunds.

```
 7  -  1050.000
 5  -    75.000
 6  -     9.000
.7  -     1.050
.5  -      750
       ─────────
```

Anſr. F. Mds. 1135.125=5 ſrs.

(7) In 840 bazar maunds how many Madras maunds?

```
8  -  2628.266
4  -   131.413
      ─────────
```

Anſr. Mad. Mds. 2759.679 = 5 vis. 17 pol.

(8) In factory mds. 65 10 ſrs. how many Madras mds.?

6 - 179

6 - 179.2000
5 - 14.9333
2 - 5975
5 - 1493

Anſr. Madras mds. 194.8799=7 vis. 1 pol.

(9) In 5 cands. 14 mds. 4 vis. of Madras, how many bazar maunds?

20 1 - 030.4383
—— 1 - 03.0438
114 mds. 4 - 1.2175
5 - 1521

Anſr. B. mds. 34.8517=34 ſrs. 1 ch.

TABLE IX.

TABLE IX.

DECIMAL PARTS OF A RUPEE.

As. Pice.	Decimal Parts.	As. Pice.	Decimal Parts.	As. Pice.	Decimal Parts.	As. Pice.	Decimal Parts.
1	0052083	1	2552083	1	5052083	1	7552083
2	0104166	2	2604166	2	5104166	2	7604166
3	015625	3	265625	3	515625	3	765625
4	0208333	4	2708333	4	5208333	4	7708333
5	0260416	5	2760416	5	5260416	5	7760416
6	03125	6	28125	6	53125	6	78125
7	0364583	7	2864583	7	5364583	7	7864583
8	0416666	8	2916666	8	5416666	8	7916666
9	046875	9	296875	9	546875	9	796875
10	0520833	10	3020833	10	5520833	10	8020833
11	0572916	11	3072916	11	5729166	11	8072916
1 As.	0625	5 As.	3125	9 As.	5625	13 As.	8125
1	0677083	1	3177083	1	5677083	1	8177083
2	0729166	2	3229166	2	5729166	2	8229166
3	078125	3	328125	3	578125	3	828125
4	0833333	4	3333333	4	5833333	4	8333333
5	0885416	5	3385416	5	5885416	5	8385416
6	09375	6	34375	6	59375	6	84375
7	0989583	7	3489583	7	5989583	7	8489583
8	1041666	8	3541666	8	6041666	8	8541666
9	109375	9	359375	9	609375	9	859375
10	1145833	10	3645833	10	6145833	10	8645833
11	197916	11	3697916	11	6197916	11	8697916
2 As.	125	6 As.	375	10 As.	625	14 As.	875
1	1302083	1	3802083	1	6302083	1	8802083
2	1354166	2	3854166	2	6354166	2	8854166
3	140625	3	390625	3	640625	3	890625
4	1458333	4	3958333	4	6458333	4	8958333
5	151041	5	4010416	5	6510416	5	9010416
6	15625	6	40625	6	65625	6	90625
7	1614583	7	4114583	7	6614583	7	9114583
8	1666666	8	4166666	8	6666666	8	9166666
9	171875	9	421875	9	671875	9	921875
10	177083	10	4270833	10	6770833	10	9270833
11	1822916	11	4322916	11	6822916	11	9322916
3 As.	1875	7 As.	4375	11 As.	6875	15 As.	9375
1	1927083	1	4427083	1	6927083	1	9427083
2	1979166	2	4479166	2	6979166	2	9479166
3	203125	3	453125	3	703125	3	953125
4	2083333	4	4583333	4	7083333	4	9583333
5	2135416	5	4635416	5	7135416	5	9665416
6	21875	6	46875	6	71875	6	96875
7	2239583	7	4739583	7	7239583	7	9739583
8	2291666	8	4791666	8	7291666	8	9791666
9	234375	9	484375	9	734375	9	984375
10	2395833	10	4895833	10	7395833	10	9895833
11	2447916	11	4947916	11	7447916	11	9947916
4 As.	25	8 As.	45	12 As.	75	1 Rup.	1000000

TABLE X.

DECIMAL PARTS OF A POUND STERLING.

Pence 1	0041666	3 Shill.	1500000	6 Shill.	3000000	9 Shill.	4500000
2	0083333	1	541666	1	3041666	1	4541666
3	0125000	2	1583333	2	3083333	2	4583333
4	0166666	3	1625000	3	3125000	3	4625000
5	0208333	4	1666666	4	3166666	4	4666666
6	0250000	5	1708333	5	3208333	5	4708333
7	0291666	6	1750000	6	3250000	6	4750000
8	0333333	7	1791666	7	3291666	7	4791666
9	0375000	8	1833333	8	3333333	8	4833333
10	0416666	9	1875000	9	3375000	9	4875000
11	0458333	10	1916666	10	3416666	10	4916666
		11	1958333	11	3458333	11	4958333
Shill.	0500000	4 Shill.	2000000	7 Shill.	3500000	10 Shill.	5000000
1	0541666	1	2041666	1	3541666	1	5041666
2	0583333	2	2083333	2	3583333	2	5083333
3	0625000	3	2125000	3	3625000	3	5125000
4	0666666	4	2166666	4	3666666	4	5166666
5	0708333	5	2208333	5	3708333	5	5208333
6	0750000	6	2250000	6	3750000	6	5250000
7	0791666	7	2291666	7	3791666	7	5291666
8	0833333	8	2333333	8	3833333	8	5333333
9	0875000	9	2375000	9	3875000	9	5375000
10	0916666	10	2416666	10	3916666	10	5416666
11	0958333	11	2458333	11	3958333	11	5458333
2 Shill.	1000000	5 Shill.	2500000	8 Shill.	4000000	11 Shill.	5500000
1	1041666	1	2541666	1	4041666	1	5541666
2	1083333	2	2583333	2	4083333	2	5583333
3	1125000	3	2625000	3	412500	3	5625000
4	1166666	4	2666666	4	4166666	4	5666666
5	1208333	5	2708333	5	4208333	5	5708333
6	1250000	6	2750000	6	4250000	6	5750000
7	1291666	7	2791666	7	4291666	7	5791666
8	1333333	8	2833333	8	4333333	8	5833333
9	1375000	9	2875000	9	4375000	9	5875000
10	1416666	10	2916666	10	4416666	10	5916666
11	1458333	11	2958333	11	4458333	11	5958333

TABLE X.

DECIMAL PARTS OF A POUND STERLING.

12 Sh.	6000000	14 Sh.	7000000	16 Sh.	8000000	18 Sh.	9000000
1	6041666	1	7041666	1	8041666	1	9041666
2	6083333	2	7083333	2	8083333	1	9083333
3	6125000	3	7125000	3	8125000	3	9125000
4	6166666	4	7166666	4	8166666	4	9166666
5	6208333	5	7208333	5	8208333	5	9208333
6	6250000	6	7250000	6	8250000	6	9250000
7	6291666	7	7291666	7	8291666	7	9291666
8	6333333	8	7333333	8	8333333	8	9333333
9	6375000	9	7375000	9	8375000	9	9375000
10	6416666	10	7416666	10	8416666	10	9416666
11	6458333	11	7458335	11	8458333	11	9458333
13 Sh.	6500000	15 Sh.	7500000	16 Sh.	8500000	19 Sh.	9500000
1	6541666	1	7541666	1	8541666	1	0541666
2	6583333	2	7583333	2	8583333	2	9583333
3	9625000	3	7625000	3	8625000	3	9625000
4	6666666	4	7666666	4	8666666	4	9666666
5	6708333	5	7708333	5	8708333	5	9708333
6	6750000	6	7750000	6	8750000	6	9750000
7	6791666	7	7791666	7	8791666	7	9791666
8	6833333	8	7833333	8	8833333	8	9833333
9	6875000	9	7875000	9	8875000	9	9875000
10	6916666	10	7916666	10	8916666	10	9916666
11	6958333	11	7958333	11	8958333	11	9958333

TABLE XI.

DECIMAL PARTS OF A MAUND.

Ch.	1	0015625	3Srs.		0750000	6Srs.		1500000	9Srs.		2250000
	2	0031250		1	0765625		1	1515625		1	2265625
	3	0046875		2	0781250		2	1531250		2	2281250
	4	0062500		3	0796875		3	1546875		3	2226875
	5	0078125		4	0812500		4	1562500		4	2312500
	6	0093750		5	0828125		5	1578125		5	2328125
	7	0109375		6	0843750		6	1593750		6	2343750
	8	0125000		7	0859375		7	1609375		7	2359375
	9	0140625		8	0875000		8	1625000		8	2375000
	10	0156250		9	0890625		9	1640625		9	2390625
	11	0171875		10	0906250		10	1656250		10	2406250
	12	0187500		11	0921875		11	1671875		11	2421875
	13	0203125		12	0937500		12	1687500		12	2437500
	14	0218750		13	0953125		13	1703125		13	2453125
	15	0234375		14	0968750		14	1718750		14	2468750
1 Sr.		0250000		15	0984375		15	1734375		15	2484375
	1	0265625	4Srs.		1000000	7Srs.		1750000	10Srs.		2500000
	2	0281250		1	1015625		1	1765625		1	2515625
	3	0296875		2	1031250		2	1781250		2	2531250
	4	0312500		3	1046875		3	1796875		3	2546875
	5	0328125		4	1062500		4	1812500		4	2562500
	6	0343750		5	1078125		5	1828125		5	2578125
	7	0359375		6	1093750		6	1843750		6	2593750
	8	0375000		7	1109375		7	1859375		7	2609375
	9	0390625		8	1125000		8	1875005		8	2625000
	10	0406250		9	1140625		9	1890625		9	2640625
	11	0421875		10	1156250		10	1906250		10	2656250
	12	0437500		11	1171875		11	1921875		11	2671875
	13	0453125		12	1187500		12	1937500		12	2687500
	14	0468750		13	1203125		13	1953125		13	2703125
	15	0484375		14	1218750		14	1968750		14	2718750
2Srs.		0500000		15	1234375		15	1984375		15	2734375
	1	0515625	5Srs.		1250000	8Srs.		2000000	Srs. 11		2730000
	2	0531250		1	1265625		1	2015625		1	2765625
	3	0546875		2	1281250		2	2031250		2	2781250
	4	0562500		3	1296875		3	2046875		3	2796875
	5	0578125		4	1312500		4	2062530		4	2812500
	6	0593750		5	1328125		5	2078125		5	2828125
	7	0609375		6	1343750		6	2093750		6	2843750
	8	0625000		7	1359375		7	2109375		7	2859375
	9	0640625		8	1375000		8	2125000		8	2875000
	10	0656250		9	1390625		9	2140625		9	2890625
	11	0671875		10	1406250		10	2156250		10	2906250
	12	0687500		11	1421875		11	2171875		11	2921875
	13	0703125		12	1437500		12	2187005		12	2937500
	14	0718750		13	1453125		13	2203125		13	2953125
	15	0734375		14	1468750		14	2218750		14	2968750
				15	1484375		15	2234375		15	2984375

TABLE XI.

DECIMAL PARTS OF A MAUND.

12 Srs.	3000000	15 Srs.	3750000	18 Srs.	4500000	21 Srs.	5250000
1	3015625	1	3765625	1	4515625	1	5265625
2	3031250	2	3781250	2	4531250	2	5281250
3	3046875	3	3796875	3	4546875	3	5296875
4	3062500	4	3812500	4	4562500	4	5312500
5	3078125	5	3828125	5	4578125	5	5328125
6	3093750	6	3843750	6	4593750	6	5343750
7	3109375	7	3859375	7	4609375	7	5359375
8	3125000	8	3875000	8	4625000	8	5375000
9	3140625	9	3890625	9	4640625	9	5390625
10	3156250	10	3906250	10	4656250	10	5406250
11	3171875	11	3921875	11	4671875	11	5421875
12	3187500	12	3937500	12	4687500	12	5437500
13	3203125	13	3953125	13	4703125	13	5453125
14	3218750	14	3968750	14	4718750	14	5468750
15	3234375	15	3984375	15	4734375	15	5484375
13 Srs.	3250000	16 Srs.	4000000	19 Srs.	4750000	22 Srs.	5500000
1	3265625	1	4015625	1	4765625	1	5515625
2	3281250	2	4031250	2	4781250	2	5531250
3	3296875	3	4046875	3	4796875	3	5546875
4	3312500	4	4062500	4	4812500	4	5562500
5	3328125	5	4078125	5	4828125	5	5578125
6	3343750	6	4093750	6	4843750	6	5593750
7	3359375	7	4109375	7	4859375	7	5609375
8	3375000	8	4125000	8	4875000	8	5625000
9	3390625	9	4140625	9	4890625	9	5640625
10	3406250	10	4156250	10	4906250	10	5656250
11	3421875	11	4171875	11	4921875	11	5671875
12	3437500	12	4187500	12	4937500	12	5687500
13	3453125	13	4203125	13	4953125	13	5703125
14	3468750	14	4218750	14	4968750	14	5718750
15	3484375	15	4234375	15	4984375	15	5734375
14 Srs.	3500000	17 Srs.	4250000	20 Srs.	5000000	23 Srs.	5750000
1	3515625	1	4265625	1	5015625	1	5765625
2	3531250	2	4281250	2	5031250	2	5781250
3	3546875	3	4296875	3	5046875	3	5796875
4	3562500	4	4312500	4	5062500	4	5812500
5	3578125	5	4328125	5	5078125	5	5828125
6	3593750	6	4343750	6	5093750	6	5843750
7	3609375	7	4359375	7	5109375	7	5859375
8	3625000	8	4375000	8	5125000	8	5875000
9	3640625	9	4390625	9	5140625	9	5890625
10	3656250	10	4406250	10	515625	10	5906250
11	3671875	11	4421875	11	5171875	11	5921875
12	3687500	12	4437500	12	5187500	12	5937500
13	3703125	13	4453125	13	5203125	13	5953125
14	3718750	14	4468750	14	5218750	14	5968750
15	3734375	15	4484375	15	5233575	15	5984375

TABLE XI.

DECIMAL PARTS OF A MAUND.

27 Srs.	6000000	30 Srs.	6750000	33 Srs.	7500000	36 Srs.	8250000
1	6015625	1	6765625	1	7515625	1	8265625
2	6031250	2	6781250	2	7531258	2	8281250
3	6046875	3	6796875	3	7546875	3	8296875
4	6062500	4	6812500	4	7562500	4	8312500
5	6078125	5	6828125	5	7578125	5	8328125
6	6093750	6	6843750	6	7593750	6	8343750
7	6109375	7	6859735	7	7609735	7	8359375
8	6125000	8	6875000	8	7625000	8	8375000
9	6140625	9	6890625	9	7640625	9	8390625
10	6156250	10	6906250	10	7656250	10	8406250
11	6171875	11	6921875	11	7671875	11	8421875
12	6187500	12	6937500	12	7687500	12	8437500
13	6203125	13	6953125	13	7703125	13	8453125
14	6218750	14	6968750	14	7718750	14	8468750
15	6234375	15	7984375	15	7734375	15	8484375
28 Srs.	6250000	31 Srs.	7000000	34 Srs.	7750000	37 Srs.	8500000
1	6265625	1	7015625	1	7765625	1	8515625
2	6281250	2	7031250	2	7781250	2	8531250
3	6296875	3	7046875	3	7796875	3	8546875
4	6312500	4	7062500	4	7812500	4	8562500
5	6328125	5	7078125	5	7828125	5	8578125
6	6343750	6	7093750	6	7843750	6	8593750
7	6359375	7	7109375	7	7859375	7	8609375
8	6375000	8	7125000	8	7875000	8	8625000
9	6390625	9	7140625	9	7890625	9	8640625
10	6406250	10	7156250	10	7906250	10	8656250
11	6421875	11	7171875	11	7921875	11	8671875
12	6437500	12	7187500	12	7937500	12	8687500
13	6453125	13	7203125	13	7953125	13	8703125
14	6468750	14	7218750	14	7968750	14	8718750
15	6484375	15	7234375	15	7984375	15	8734375
29 Srs.	6500000	32 Srs.	7250000	35 Srs.	8000000	38 Srs.	8750000
1	6515625	1	7265625	1	8015625	1	8765625
2	653125	3	7281250	2	8031250	2	8781250
3	6546875	2	7296875	3	8046875	3	8796875
4	6562500	4	7312500	4	8062500	4	8812500
5	6578125	5	7328125	5	8078125	5	8828125
6	6593750	6	7343750	6	8093750	6	8843750
7	6609375	7	7359375	7	8109375	7	8859375
8	6625000	8	7375000	8	8125000	8	8875000
9	6640625	9	7390625	9	8140625	9	8890625
10	6656250	10	7406250	10	8156250	10	8906250
11	6671875	11	7421875	11	8171875	11	8921875
12	6687500	12	7437500	12	8187500	12	8937500
13	6703125	13	7453125	13	8203125	13	8953125
14	6718750	14	7468750	14	8218750	14	8968750
15	6734375	15	7484375	15	8234375	15	8984375

TABLE XI.

DECIMAL PARTS OF A MAUND.

36 Srs.	9000000	37 Srs.	9250000	38 ſrs.	9500000	39 ſrs.	9750000
1	9015625	1	9265625	1	9515625	1	9765625
2	9031250	2	9281250	2	9531250	2	9781250
3	9046875	3	9296875	3	9546875	3	9796875
4	9062500	4	9312500	4	9562500	4	9812500
5	9078125	5	9328125	5	9578125	5	9828125
6	9093750	6	9343750	6	9593750	6	9843750
7	9109375	7	9359375	7	9609375	7	9859375
8	9125000	8	9375000	8	9625000	8	9875000
9	9140625	9	9390625	9	9640625	9	9890625
10	9156250	10	9406250	10	9656250	10	9906250
11	9171875	11	9421875	11	9671875	11	9921875
12	9187500	12	9437500	12	9687500	12	9937500
13	9203125	13	9453125	13	9703125	13	9953125
14	9218750	14	9468750	14	9718750	14	9968750
15	9234375	15	9484375	15	9734375	15	9984375

TABLE XII.

TABLE XII.

DECIMAL PARTS OF A HUNDRED WEIGHT.

qr.	lb.	oz.		qr.	lb.	oz.		qr.	lb.	oz.	
		4	0022321		11		0982143		22		1964286
		8	0044643			4	1004464			4	1986607
		12	0066964			8	1026786			8	2008928
	1		0089286			12	1049107			12	2031250
		4	0111607		12		1071428		23		2053571
		8	0133928			4	1093750			4	2075893
		12	0156250			8	1116071			8	2098214
	2		0178571			12	1138393			12	2120536
		4	0200893		13		1160714		24		2142857
		8	0223214			4	1183036			4	2165178
		12	0245536			8	1205357			8	2187500
	3		0267857			12	1227678			12	2209821
		4	0290178		14		1250000		25		2232143
		8	0312500			4	1272321			4	2254464
		12	0334821			8	1294643			8	2276786
	4		0357143			12	1316963			12	2299107
		4	0379464		15		1339286		26		2321428
		8	0401786			4	1361607			4	2343750
		12	0424107			8	1383928			8	2366071
	5		0446428			12	1406250			12	2388393
		4	0468750		16		1428571		27		2410764
		8	0491071			4	1450893			4	2433036
		12	0513393			8	1473214			8	2455357
	6		0535714			12	1495536			12	2477678
		4	0558036		17		1517857	1			2500000
		8	0580357			4	1540178			4	2522321
		12	0602678			8	1562500			8	2544643
	7		0625000			12	1584821			12	2566964
		4	0647321		18		1607143	1	1		2589286
		8	0669643			4	1629464			4	2611607
		12	0691964			8	1651786			8	2633928
	8		0714286			12	1674107			12	2656250
		4	0736607		19		1696428	1	2		2678571
		8	0758928			4	1718750			4	2700893
		12	0781250			8	1741071			8	2723214
	9		0803571			12	1763393			12	2745536
		4	0825893		20		1785714	1	3		2767857
		8	0848214			4	1808036			4	2790178
		12	0870536			8	1830357			8	2812500
	10		0892857			12	1852678			12	2834821
		4	0915178		21		1875000	1	4		2857143
		8	0937500			4	1897321			4	2879464
		12	0959821			8	1919643			8	2901786
						12	1941964			12	2924107

TABLE XII.

DECIMAL PARTS OF AN HUNDRED WEIGHT.

qr.	lb.	oz.		qr.	lb.	oz.		qr.	lb.	oz.	
1	5		2946428	1	16		3928571	1	27		4910764
		4	2968750			4	3950893			4	4933036
		8	2991071			8	3973214			8	4955357
		12	3013393			12	3995536			12	4977678
1	6		3035714	1	17		4017857	2			5000000
		4	3058036			4	4040178			4	5022321
		8	3080357			8	4062500			8	5044643
		12	3102678			12	4084821			12	5066964
1	7		3125000	1	18		4107143	2	1		5089286
		4	3147321			4	4129464			4	5111607
		8	3169643			8	4151786			8	5133928
		12	3191964			12	4174107			12	5156250
1	8		3214286	1	19		4196428	2	2		5178571
		4	3236607			4	4218750			4	5200893
		8	3258928			8	4241071			8	5223214
		12	3281250			12	4263393			12	5245536
1	9		3303571	1	20		4285714	2	3		5267857
		4	3325893			4	4308036			4	5290178
		8	3348214			8	4330357			8	5312500
		12	3370536			12	4352678			12	5334821
1	10		3392857	1	21		4375000	2	4		5357143
		4	3415178			4	4397321			4	5379464
		8	3437500			8	4419643			8	54 1786
		12	3459821			12	4441964			12	5424107
1	11		3482143	1	22		4464286	2	5		5446428
		4	3504464			4	4486607			4	5468750
		8	3526786			8	4508928			8	5491071
		12	3549107			12	4531250			12	5513393
1	12		3571428	1	23		4553571	2	6		5535714
		4	3593750			4	4575893			4	5558036
		8	3616071			8	4598214			8	5580357
		12	3638393			12	4620536			12	5602678
1	13		3660714	1	24		4642857	2	7		5625000
		4	3683036			4	4665178			4	5647321
		8	3705357			8	4687500			8	5669643
		12	3727678			12	4709821			12	5691964
1	14		3750000	1	25		4732143	2	8		5714286
		4	3772321			4	4754464			4	5736607
		8	3794643			8	4776786			8	5758928
		12	3816964			12	4799107			12	5781250
1	15		3839286	1	26		4821428	2	9		5803571
		4	3861607			4	4843750			4	5825893
		8	3883928			8	4866071			8	5848214
		12	3906250			12	4888393			12	5870536

TABLE XII.

DECIMAL PARTS OF AN HUNDRED WEIGHT.

qr.	lb.	oz.		qr.	lb.	oz.		qr.	lb.	oz.	
2	10		5892857	2	21		6875000	3	4		7857143
		4	5915178			4	6897321			4	7879464
		8	5937500			8	6919643			8	7901786
		11	5959821			12	6941964			12	7924107
2	11		5982143	2	22		6964286	3	5		7946428
		4	6004464			4	6986607			4	7968759
		8	6026786			8	7008928			8	7991071
		12	6049107			12	7031250			12	8013393
2	12		6071428	2	23		7053571	3	6		8035714
		4	6093750			4	7075893			4	8058036
		8	6116071			8	7098214			8	8080357
		12	6138393			12	7120536			12	8102678
2	13		6160714	2	24		7142857	3	7		8125000
		4	6183036			4	7165178			4	8147321
		8	6205357			8	7187500			8	8169643
		12	6227678			12	7209821			12	8191964
2	14		6250000	2	25		7232143	3	8		8214286
		4	6272321			4	7254464			4	8236607
		8	6294643			8	7276786			8	8258928
		12	6316964			12	7299107			12	8281250
2	15		6339286	2	26		7321428	3	9		8303571
		4	6361607			4	7343750			4	8325893
		8	6383928			8	7366071			8	8348214
		12	6406250			12	7388393			12	8370536
2	16		6428571	2	27		7410714	3	10		8392857
		4	6450893			4	7433035			4	8415178
		8	6473214			8	7455357			8	8437500
		12	6495536			12	7477678			12	8459821
2	17		6517857	3			7500000	3	11		8482143
		4	6540178			4	7522321			4	8504464
		8	6562500			8	7544643			8	8526786
		12	6584821			12	7566964			12	8549107
2	18		6607143	3	1		7589286	3	12		8571428
		4	6629464			4	7611607			4	8593759
		8	6651786			8	7633928			8	8616071
		12	6674107			12	7656259			12	8638393
2	19		6696428	3	2		7678571	3	13		8660714
		4	6718750			4	7700893			4	8683036
		8	6741071			8	7723214			8	8705357
		12	6763393			12	7745536			12	8727678
2	20		6785714	3	3		7767857	3	14		8750000
		4	6808036			4	7790178			4	8772321
		8	6830357			8	7812599			8	8794643
		12	6852678			12	7834821			12	8816964

TABLE XII.

DECIMAL PARTS OF AN HUNDRED WEIGHT.

qr. lb. oz.		qr. lb. oz.		qr. lb. oz.	
3 15	8839286	3 19 8	9241071	3 24	9642857
4	8861607	12	9263393	4	9665178
8	8883928	3 20	9285714	8	9687500
12	8906250	4	9308036	12	9709821
3 16	8928571	8	9330357	3 25	9732143
4	8950893	12	9352678	4	9754464
8	8973214	3 21	9375000	8	9776786
12	8995536	4	9397321	12	9799107
3 17	9017857	8	9419643	3 26	9821428
4	9040178	12	9441964	4	9843750
8	9062500	3 22	9464286	8	9866071
12	9084821	4	9486607	12	9888393
3 18	9107143	8	9508928	3 27	9910714
4	9129464	12	9531250	4	9933036
8	9151786	3 23	9553571	8	9955357
12	9174107	4	9575893	12	9977678
3 19	9196428	8	9598214	1 cwt.	1.00000
4	9218750	12	9620536		

EXPLANATION

OF TABLES

IX, X, XI, and XII.

THE uſe of the foregoing Decimal Tables is to aſcertain the value of their various parts, and where calculations are made with decimals, in preference to whole numbers, to ſhew the decimals equal to any part of the integer for which the Table is given, and which is clearly exemplified in the following examples: for oppoſite the ſum required to be reduced to decimals, will be found its decimals, and oppoſite every decimal part propoſed, will be found its value, but if the exact decimal is not to be found in the Table, then take the next leſs, which will be fully ſufficient.

(1) What is the decimal of 7 a. 9 p? Anſr. .484375.

(2) What is the value of .4375 of a pound ſterling? Anſr. 8ſ. 9d.

(3) What is the decimal of 15 ſeers, 8 chittacks? Anſr. .3875.

(4) What is the value of .49567 of a cwt.? Anſr. 1qr. 27 lbs. 8oz.